The Builder.

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Council Chamber, Town Hall, Deptford ..... Messrs. Lanchester and Rickards, Architects.
Eastbourne Technical Institute ..... Mr. Philip A. Robson, A.R.I.B.A., Architect.
Decorative Design: "The Steam Hammer" ..... By Mr. W. J. Stamps.
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Ancient Egyptian Building.

IN his latest contribution to the history of architecture,* M. Choisy returns to the consideration of a subject he had already treated in his general history published in 1899. He simplifies his description, however, of Egyptian architecture, and puts forward a new theory to account for the undulating curves found in the crude brick walls at Abydos and Karnak. In the more detailed account he gives of the Egyptian methods of building vaults and domes in unburnt brick without centring, he shows many varied methods of strengthening the vaults which have not hitherto been noticed. By far the most important part of the whole work is that devoted to stone construction, in which M. Choisy deals with the quarrying and transport of materials—the raising of and fixing in position the great blocks of stone used in the Pyramids and Temples, and the precautions taken when lowering the same into their position, as also those for the obelisks and for the portcullises in the pyramids. His description of the processes employed comes virtually to us as a revelation, and shows a knowledge of engineering which is far beyond that which could be imagined as possessed by one of the earliest races of mankind.

* L'Art de bâtir chez les Egyptiens. Par Auguste Choisy. Sm. f°. Paris: Edouard Rouveyre; 1904.

The chapter which deals with the waving curves in brick is illustrated by many photogravures at the end of the book, the first four of which, at Philæ and Esneh, represent undulating courses in masonry to which M. Choisy's new theory would not apply. It had generally been supposed that these courses were precautions taken against earthquakes, but M. Choisy points out that in some cases such walls are found on the natural rock where there could be no fear of a settlement. In his "History of Architecture" M. Choisy pointed out that when building walls the masons made use of a stretched cord to regulate the course levels, a system employed from time immemorial down to the present day, but to suggest, as he does in his History, p. 19, that as the cord sunk in the middle the course followed the sinking—"Le cordeau fléchit en son milieu: le lit suit la flexion du cordeau directeur"—does not appeal to us.

In his present work he puts forward another theory which is more reasonable, though whether it can be proved in every instance is doubtful. As there is no rainfall in Egypt, a wall in that country in crude or unburnt bricks did not require that protection which was given to it in other countries, as, for instance, the layers of burnt brick, or tiles, on the top of the walls, and the stucco casing given to the sides in Greece and Rome; but, when in the proximity of water, M. Choisy points out that certain hygrometric changes take place—the moisture from below is drawn up into the brickwork by the heat of the sun during the day, whilst at night the condensation of this moisture causes the bricks to swell and dislocates the wall; or if built on an incline, gives a tendency to slide downwards. M. Choisy points out that the concave bed would prevent the latter, and by leaving open joints at the junction of the concave and convex beds these would simply close up at night. There are, however, undulating courses found in brick walls at Abydos which are far distant from the river or any inland lake to which this theory would not apply, and certainly in the walls represented in the first four photogravures the moisture could not affect the masonry, nor could it well be drawn up through the same to the crude brick above, so that further research is required here.

When, however, we come to the account given by M. Choisy of the transport of large blocks of stone, and the raising and bedding them in their position, not only is the evidence given of the most convincing character, but it is the result of observation which it was open to anyone to make; no excavations were required, everything was above ground, and the features to which M. Choisy calls attention have been seen by hundreds of travellers without any attempt to follow their meaning or object before he entered the field.

The theory commonly accepted, that the blocks of stone were hauled up inclined planes of sand which were afterwards removed, had its origin in a traditional custom which is sometimes

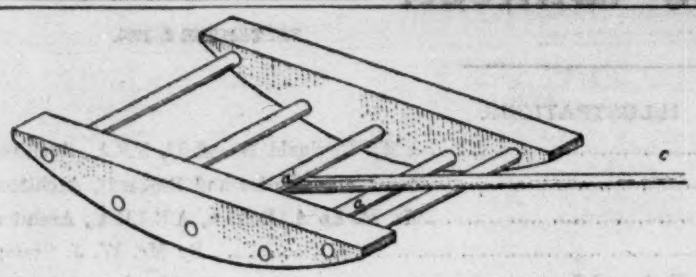

Fig. 1. *The Rocker.*

actually employed at the present day. One of the columns in the Great Hall at Karnak was taken down stone by stone, and, after a new solid foundation had been laid, was rebuilt by the same method, there being from 100 to 150 men, women, and children employed in raising the mound and afterwards removing it. But this system, M. Choisy points out, could not have been followed in the case of the erection of the great Pylons, sometimes over 100 ft. in height, as there would be no room for the inclined planes of requisite length. Moreover, with an inclined plane in the proportion of one in height to only two in the base, 500 men would be required to haul up a stone weighing 15 tons, and where could those 500 men have been posted? On the inclined plane itself their feet would have slipped, and there would be no room on the narrow platform of the pylon. This led M. Choisy to the conclusion that the stones must have been raised in the same way as they were on the pyramids, where the scaffolding, if it may be so termed, existed in the natural construction of the pyramid itself; that is to say, the stones were raised step by step either by means of levers of various kinds or by an apparatus which he calls the *ascenseur oscillant* (rocking cradle). This cradle consisted of two beams of timber of segmental shape, which were framed together with stout wooden bars (Fig. 1). Numerous models of this apparatus have been found in the tombs, and they have always been assumed to be centerings for an arch or vault; but M. Choisy points out that all their arches and vaults were built without centering, so that they must have served some other purpose. On to this cradle, according to his theory, the blocks of stone were shifted by means of an inclined plane, and then by the use of levers and small blocks of stone introduced one side or the other as the cradle was rocked the stone was gradually raised, and ultimately shifted on to the upper bed. In the case of the pyramids the height of the step varied from 4 to 5 ft. Herodotus, quoting the description given him by the priests as to the erection of the pyramids, says that: "The blocks were raised from one stage to the other by means of machines made of short pieces of wood"—a description which, in the main, agrees with M. Choisy's supposition, and with his conjectural illustration, shown in our Fig. 2 (page 82 in the book). In support of his theory, so far as the erection of the pylons is concerned, M. Choisy calls attention to the remains of the temporary step platform which was erected in the great court of the Temple at Karnac, and as those remains are shown in two photogravures on Plate XIV., and must be known to every traveller, there can be no dispute as to their existence. As this pylon was erected about 700 B.C., twenty-six centuries have elapsed since this temporary staging was built. The remains have generally been supposed to be works of late date raised when the courts were taken possession of by squatters, but the illustrations show a series of walls parallel to one another with steps setting back, a construction of no use as a habitation. In pushing his inquiry further M. Choisy ascertained that in the side portico, which this mound partially masked, the capitals of the columns have been left *en bloc*, or, as he says, "brut," and Plate XV. shows us one of these capitals, the stones of which have never been worked down. As will be seen in Plate XIV., the temporary scaffolding consisted of a series of walls parallel to one another and built up against the pylon; as the pylon rose in height, the walls may have been built further out and stone slabs laid across or steps from wall to wall. M. Choisy, however, on p. 90, gives a diagram in which the base of the staging was built out to its full depth at first. In his conjectural restoration on p. 89 it will be seen that this series of platforms was raised to its full height only in the centre of the pylon wall (Fig. 3). The Egyptian masons having raised the stones in the centre, lowered them down to the sides; that is to say, they made use of the stone courses of the pylon itself, and this may have been done in some cases by commencing the erection of the same at one or both ends. That this was done in the case of ordinary walls we gather from M. Choisy's diagram on p. 96, in which the ordinary stone courses serve as steps, up which the blocks were raised.

The last chapter in M. Choisy's book, which deals with the transport and raising into position of monoliths, is perhaps the most remarkable, because it not only describes how these huge blocks—sometimes weighing over 200 tons—were quarried, taken down the Nile long distances and raised into their position, but shows the minute precautions which had to be taken when lowering them into position, as in the case of obelisks, or bedding them side by side as in the roof of Karnak (where some of the stone slabs weigh 40 tons each), with so close a joint that it is impossible to insert a sheet of paper between the adjoining blocks.

On the pedestal which carries the obelisk brought from Luxor in the Place de la Concorde, at Paris, has been engraved a diagram showing how the obelisk was first raised and then lowered into its position, a work which taxed the resources of the French engineer. From the number and size of those erected in Egypt, however, with no explanatory diagrams of the way in which the work was done, we must assume that the precautions which the Egyptians found it necessary to take were the result of many experiences and perhaps failures. Queen Hatasu, the daughter of Thothmes III., boasts that one of the larger obelisks, over 100 ft. high, which she set up at Karnak, was quarried at Assouan, brought down the Nile (about 150 miles), set up on its pedestal and gilded, all within the short space of seven months. On p. 124 M. Choisy gives a diagram showing how he considers the obelisks were raised and lowered into their positions, and he puts forward the theory that, in order to avoid the risk of fracture of the base, circular cylindrical sacks of sand were employed on which the obelisk descended. When these sacks were cut the sand ran out, allowing of the gradual descent of the obelisk on its base. This theory is substantiated by the fact that on the top of the pedestals from which obelisks have been taken are small semi-circular grooves, in which the empty sacks sunk, and he shows various types of grooves all destined to avoid a too sudden sinking of the obelisk. M. Choisy also describes the way in which the immense blocks of granite were lowered in the corridors leading to the tomb chambers, in order to close them after the body of the king had been deposited. These blocks were temporarily supported by wooden posts, and before removing these, sand sacks were piled up underneath, and then cut through one after the other. The last section of the chapter is devoted to the methods adopted in Greece, Assyria, and Palestine for the hauling, raising into position and building of the monoliths employed in those countries, and M. Choisy refers us to the descriptions given by Vitruvius and Pliny of the systems adopted in the Temple of Diana at Ephesus, which differ materially from those employed by the Egyptian masons.

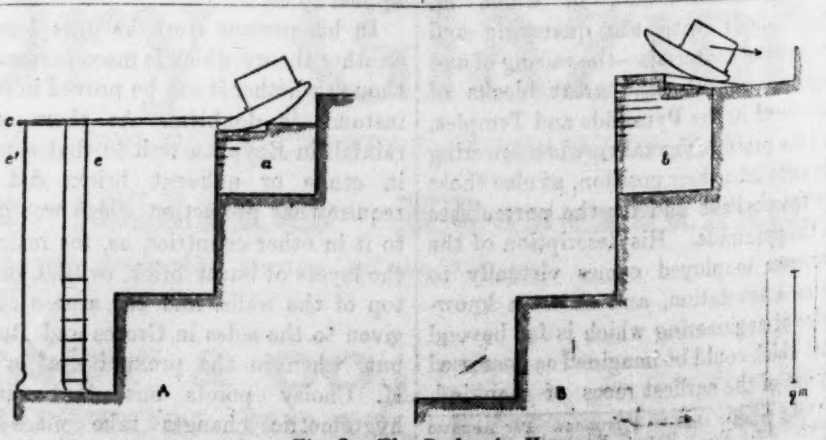

Fig. 2. *The Rocker in Use.*

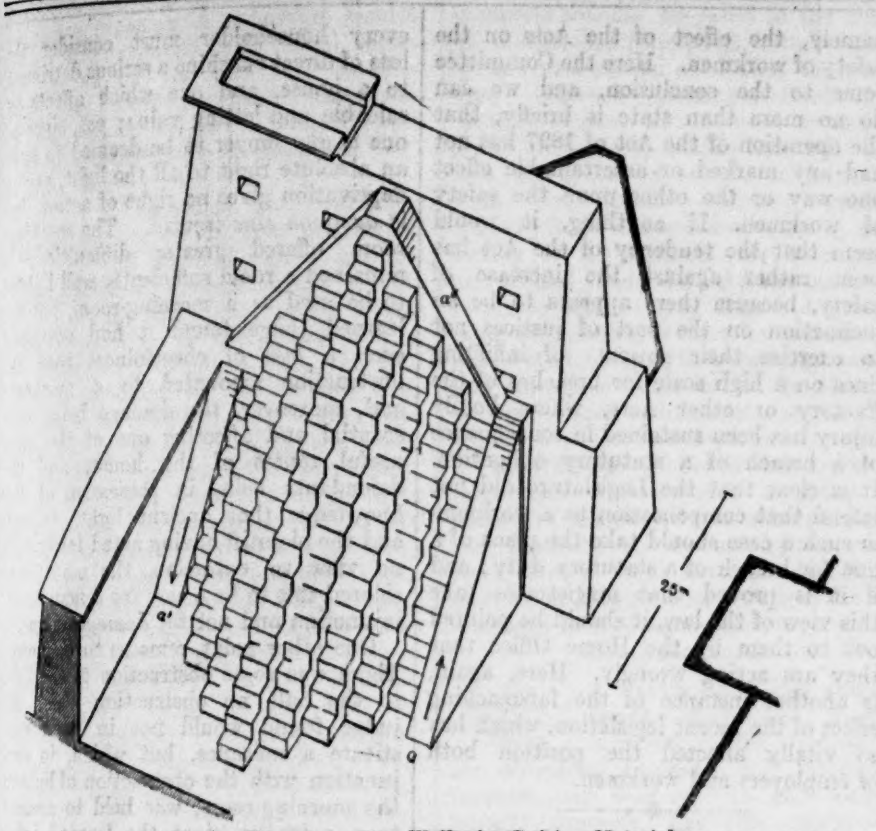

Fig. 3. Temporary Step Walls for Raising Materials.

We have only been able to deal in this article with some of the leading problems put forward in M. Choisy's work; although compressed into a small compass—for there are only 135 pages of text, and about twenty lines in a page—the result of his researches might be expanded into several volumes. The book is illustrated with over 100 diagrams, which explain his theories in the simplest and clearest manner, and the addition of the forty-eight photogravures at the close of the work is of special value, because they represent views which the ordinary photographer would not deem worthy of taking, but which prove that in the greater number of cases the theories put forward have a most substantial basis of fact.

In selecting the author of this book as the recipient of the Royal Gold Medal this year, the Institute has added a very distinguished name to their list. M. Choisy has contributed materially to our knowledge of the construction of bygone ages, which, as a rule, has never been properly approached by the ordinary historian. His early training as a mathematician and engineer specially fitted him for the researches to which he has devoted the greater portion of his life, and his accurate powers of observation and his acute reasoning faculties have led to a most successful and interesting result.

THE SANITARY INSTITUTE.—The usual course of educational lectures for sanitary officers will be commenced at the Parkes Museum on Monday, September 12, the succeeding lectures following on Mondays, Wednesdays, and Fridays up to November 25. Among the lecturers are Mr. E. J. Steegmann (on Elementary Physics and Chemistry); Mr. J. Priestly (Sanitary Law); Messrs. W. C. Tyndale, J. Wright Clarke, and A. Saxon Snell (various constructional subjects); and Mr. J. E. Worth (Water Supply and Sewage Disposal). The usual course of visits of inspection and demonstration commences on September 17 with a visit to the Wimbledon Sewage Works. Full particulars can be obtained from the Secretary, at the Parkes Museum, 72, Margaret-street, W.

THE REPORT OF THE COMMITTEE ON WORKMEN'S COMPENSATION.

THE recently-issued Report of the Departmental Committee on the law relating to Workmen's Compensation is one of the most thorough and valuable reports which has been made for a long time. It gives a clear impression of the results of the present law, of its strong and of its weak points, and it indicates distinctly the means which are required for its improvement. Briefly stated, two main points stand out pretty conspicuously; the first is that on the whole the existing law has worked satisfactorily, even allowing for some defects; and the next is that the trend of business and of law as based on recent legislation is towards an inevitable end—namely, that the workman shall receive in all cases a reasonable indemnity against pecuniary loss by injuries sustained in the course of his employment, and that the employer will have to protect himself against severe loss by the system of insurance—a system which is becoming more and more, in all sorts of ways, an essential part of modern life.

Since 1897, it must be borne in mind, a fundamental change has taken place in the legal relations of employer and employed; that is to say, the employer in a large number of cases has become liable to pay compensation to a workman who has been injured, without a breach of contract or of any negligent act on the part of the employer. One must realise now that the question for the future must be, not whether the workman should continue to have a legal right to be relieved from some portion of the loss caused by industrial accidents, but what amendments are required in the law providing for that relief, as regards the general method and detached means of affording it; whether any and what changes are required in the extent or limit of that relief, or in the security for its provision and maintenance; and whether similar privileges should be extended to classes of workpeople "not now within the law." No legislation can, of course, give an injured workman complete compensation. All that can be obtained is that some portion of his loss should be borne by the employer—in the last resort of course by the general public. The Report is so full and at the same time so concise, that it is impossible to do more here than indicate some of the most interesting questions which it raises. Its careful perusal will well repay the time spent on it by any one interested or concerned in this question.

As regards the question of litigation, it is satisfactory to find that though there has necessarily been much of it, the Committee consider that actual fighting in the law courts "has been very small when compared with the great number of cases settled by agreement, without any recourse whatever to legal aid or to proceedings in court." Thus Colonel Bird, Chairman of the Builders' Accident Insurance Company, says that the cases taken into court are 1½ per cent. of the claims. The public is accustomed to read day by day reports of these cases, but it is not in possession of the number of accidents and claims. Satisfactory, however, as this state of things is, the Committee clearly are of opinion that by some amendments of the law the percentage of litigation to claims can be still further reduced. For example, as our readers well know, much litigation has taken place in regard to the meaning of the expression "by means of a scaffolding" in relation to the work of construction or repair, to the meaning and extent of the word "repair," and to the limitation of the benefit of the Act to building, some part of which exceed 30 ft. in height. We take these as instances of the ground of litigation. Many similar points arise in regard to other than building operations. But the trend of the Report will be clearly seen by the recommendation of the Committee in regard to this part of the Act. "We see," they write, "no effective remedy for these anomalies unless employment in building operations is brought altogether within the Act, and the distinctions depending upon height of building, use of scaffolding, employment of machinery, and character of work, are entirely done away with. Some objections on the part of the employers have been raised to this proposal, and they are not without force; they apprehend great increase of claims for small accidents, which ought not to come within the Act." But the protection at hand to the employer is the system of insurance, and, therefore, the Committee conclude that "on the whole the arguments for extending the Act so as to cover all building operations must prevail, . . . building operations should include work upon all erections upon the surface, including the work of preparing for and carrying out the foundations, for the erection, and be irrespective of the material used in construction." This is the conclusion which we have over and over again pointed out was the inevitable result of the existing law. Injustice to certain classes of workmen

by their exclusion from the benefits of the Act cannot be counterbalanced by less inconvenience to certain classes of employers by their non-liability, and the small contractor can protect himself just as well as the large contractor by means of this system of insurance. Nor need the small employer be unduly apprehensive because the Committee have come to the conclusion that "the pecuniary burden imposed by the Acts upon the employer has not been excessive." The introduction of so fundamental a change as was created by the legislation of 1897 and 1900 must necessarily have caused some dislocation of the ordinary modes of business; but time works its accommodations, and so the extension of the principles of the Acts will be less noteworthy than the first step in the change caused by their becoming law. But the mere fact that an employer is legally liable to pay compensation to his workmen does not necessarily give him the funds so to do, and the Committee evidently foresee that a further extension of the principle of compensation will be urged by giving the workman some kind of security for his compensation. At present an insolvent employer, or an insolvent insurance company, may defraud a workman of compensation. The idea of the Committee appears to be that the State at some future time may have to establish some kind of system of National Insurance and enact regulations in regard to the formation and conduct of insurance companies. This would not be so difficult a matter as to guarantee in any way the solvency of an employer, which is a difficulty which can only be met "by the substituting for the personal liability of the individual employer the security of a fund, the solvency of which was for all practical purposes assured." At present we think the time has not arrived for dealing with this part of the question; the main point is to simplify in the immediate future the law so as to lessen litigation, and enlarge the benefit of recent legislation so that all classes of workmen may equally be sharers in its advantages.

The advantages of the Act have, however, apparently not been felt by all workmen, for the Committee note that the tendency of recent legislation has been "to increase the difficulties of old men finding and retaining employment," and to lessen the employment of weak or partially maimed persons. In relation to these several classes it may be that the Act can be amended so as to lessen the liability of the employer in such cases, and thus to give them more chances of obtaining work. "We suggest," say the Committee, "as a minimum in the case of old persons, 5s. per week for injury, and, in the case of death, leaving dependents 25*l*." This is a point of great social importance, which will no doubt receive consideration; for the tendency to restrict employment to young and vigorous men only tends to make more acute the problem of old age relief generally. As we have already said, we can do no more than indicate some of the conclusions of this admirable report—a document which must remain invaluable for a long time to come.

We may, however, refer briefly to yet another point of a general character, namely, the effect of the Acts on the safety of workmen. Here the Committee come to the conclusion, and we can do no more than state it briefly, that the operation of the Act of 1897 has not had any marked or ascertainable effect one way or the other upon the safety of workmen. If anything, it would seem that the tendency of the Act has been rather against the increase of safety, because there appears to be an inclination on the part of justices not to exercise their powers of inflicting fines on a high scale for breaches of the Factory or other Acts, where bodily injury has been sustained in consequence of a breach of a statutory obligation. It is clear that the Legislature did not intend that compensation to a workman in such a case should take the place of a fine for breach of a statutory duty; and if it is proved that magistrates take this view of the law, it should be pointed out to them by the Home Office that they are acting wrongly. Here, again, is another instance of the far-reaching effect of the recent legislation, which has so vitally affected the position both of employers and workmen.

A NOTE ON THE LAW OF LIGHT.

THE case of Kine *v.* Jolly, recently decided by Mr. Justice Kekewich, is one of extreme importance in regard to the law of light, since it is the first case in which the right of parties to an injunction has had to be considered since the decision of the House of Lords in Colls *v.* Home and Colonial Stores. We have in these columns already drawn attention on several occasions to the important change in the law effected by this decision of the House of Lords, since no longer is any practical obstruction of light sufficient to give the party setting up ancient lights a right of action, but the obstruction has now to amount to a nuisance—that is, to such a deprivation of light as to render the premises substantially less fit for the purposes of occupation or habitation; moreover, the judgments in the House of Lords raised some doubts as to how far the remedy of mandatory injunction was appropriate in such cases, in place of a simple decree for damages.

The decision in Kine *v.* Jolly is of especial interest, since in the first place a mandatory injunction had been granted, but stayed pending an appeal. Before the appeal came on for hearing, the decision in Colls *v.* Home and Colonial Stores had been delivered in the House of Lords, and, consequently, the Court of Appeal remitted the action to the Court below for a re-hearing under the altered condition of the law. The plaintiff had a house at Acton, and complained of an infringement of ancient lights by the erection of a house adjoining. Taking the several heads of claim separately, it was proved that the drawing-room was deprived of direct sunlight; but since it remained a well-lighted room, fit for the purposes of a drawing-room, the learned judge was constrained to find at the second trial that no cause of action was proved within the decision of the House of Lords. No better illustration could be offered of the change now effected in the law; every householder must consider the loss of direct sunshine a serious detriment to a house, and one which affects its saleable and letting value; yet, since no one is any longer to be deemed to have an absolute right to all the light, such a deprivation gives no right of action, but is *damnum sine injuriâ*. The morning-room offered greater difficulties; it remained a room sufficiently well lighted to be used as a morning-room, but the learned judge found it had sustained such a loss of cheerfulness that the obstruction amounted to a nuisance; and, moreover, the damage being substantial and affecting one of the most useful rooms of the house, and the defendants being in possession of full knowledge that ancient lights existed, and the plaintiff having acted fairly with no view to extortion, the court considered this to be a case for a mandatory injunction and not for damages alone.

One other point remains to be noted. There was some obstruction to the light to the hall, an obstruction which the judge found would not in itself constitute a nuisance, but which, in conjunction with the obstruction of light to the morning-room, was held to amount to a nuisance, since the learned judge decided that under the new ruling the obstruction to the house as a whole must be regarded.

The court urged the parties to come to terms if they were dissatisfied with the judgment; but, in the interests of the general public, we trust these important questions may soon come before the higher tribunals for decision, and the rights of parties receive clear definition.

NOTES.

Municipal House-owning.

THE address delivered by Dr. William Smart before the British Association last week, in which he dealt with the subject of the housing of the poor, should be read with considerable interest. Professor Smart has been for two years engaged on a commission which has been investigating this question in Glasgow. It is to be observed that the Professor is strongly against municipal house-owning, except in very special circumstances. The competition of municipalities with private builders, the Professor considers, would tend to a positive diminution in the supply of houses and a consequent general rise in rents. Moreover, the supply of houses to the poorer classes under the market rate the Professor considers to have all the objections of a rate in aid of wages with a tendency to lower wages. The only legitimate field for municipal house-owning, it appears from the Professor's address, is the re-housing of certain classes of the community who have been allowed to live in slums through the neglect of the municipalities themselves, and who are willing to submit to certain restrictions with a view to improving their social status. There are interesting observations on the productive value of healthy houses with reference to wage-earning capacity and consequent ability to pay higher rents, and we commend the whole of this address to those municipalities

who are engaging in somewhat reckless re-housing schemes with small regard to the value of the sites thus occupied and the other economic conditions which appear to have received such careful consideration in Glasgow.

Coal Production. THE annual statistical tables concerning coal production, of which the latest has just been published, contain figures of considerable interest. The total known coal production of the world now is estimated at 790 million tons. In 1901 it was estimated at 700 million tons. Of this 230,334,000 tons have been produced in the United Kingdom, representing 5½ tons per head of the population. The largest coal production seems to be that of the United States—320,983,000 tons of the same denomination (2,240 lb.) as ours, but representing less than 4 tons per head of the population. The average value of the coal in this country was 7s. 8d. per ton, being about the same as in the year 1899. In 1900 it stood at the high average of 10s. 9¾d. In the United States, comparing the same dates, however, the average price of coal has risen from 5s. 3¾d. in 1900 to 6s. 6¾d. in 1903. The exports from the United Kingdom show a considerable increase despite the coal duty, being now 63,804,000 as compared with 58,405,000 in 1901. In the same period the export from the United States seems to have remained stationary at about 8 millions, but it is important to observe that the import into the United Kingdom is but 3,000 tons, leaving the excess of exports 63,802,000; whereas the import into the United States is 3,350,000 tons, leaving their export only 4,954,000 tons. In the above figures, however, the bunker coal of ships in foreign trade is included in the United Kingdom, but not in the figures for the United States. The whole report contains much most interesting statistical information.

Reading-room and New Buildings, British Museum. CONSIDERABLE dissatisfaction is expressed with the decision of the authorities to close the reading-room during the winter and spring months at 7 p.m. instead of, as has been hitherto customary, at 8 p.m. During the summer months the reading-room is closed at 7 p.m. The new regulation, which practically dismisses readers at 6.45 p.m. throughout the year, affects, besides the regular readers, a numerous class who, whilst pursuing their ordinary vocation or business during the day-time, have been enabled to avail themselves of the valuable privilege of visiting the reading-room for an hour or so in the evening for purposes of study or reference. We think, too, that if a similar concession were accorded to frequenters of the Prints and Drawings department, which is now closed at 5 p.m., the increased facility would be greatly appreciated. The demolition is in progress of the houses on the south side of Montague-place for an extension of the Museum on the northern side of the old reading-room, by the erection of a building that will form an annexe to the library and to the exhibition galleries. The frontage in Montague-place will, for the present, be 380 ft. in length; the complete scheme, prepared in the Office of Works, comprises two corner extensions or wings, and eventually the whole area between Montague-street and Bedford-square, as acquired from the Duke of Bedford, will be covered. The new block, to be erected in harmony with Sir Robert Smirke's general scheme, is to contain five stories, consisting of a basement for storage, a sub-ground floor for storage and for receiving and packing rooms, a ground floor of galleries, with a mezzanine for use of students and for general purposes, and an upper floor to be devoted to galleries and additional rooms for students. The initial plans were made at the Office of Works in the course of last year. Subsequently a group of names of architects was submitted by the Institute to the authorities, who have chosen from that list Mr. J. J. Burnet, of Glasgow, as architect for the buildings in Montague-place.

The Execution of Architectural Design. A PAPER upon this subject in the July and August numbers of the *Journal of the Franklin Institute* will probably interest our readers. As the author himself suggests, the title might be more appropriate if changed to "The Carrying Out of Architectural Purpose," although in the sense implied in his paper the "purpose" may be originally conceived by someone who is not necessarily an architect. In the second part of this paper the author deals at some length with the difficulties attending the selection of a contractor, who, as the active worker, always dominates the contract for good or ill. The problem is far more difficult in the present day, when sub-letting is general in the case of all important works. It appears that in the United States there have been signs of late in favour of a new method of dealing with large contracts—that is, for the architect to take the place of the general contractor, and so to deal directly with the various firms who carry out the work. Something may be said for direct control of this kind, but we are sure that it should not be assumed by the architect if he is to preserve that independent and disinterested position which is so desirable in the interests of clients and of the profession generally. The paper to which we refer is too long for detailed notice, but it contains many points that are worthy of consideration.

New Process for Fireproofing Wood. A SYSTEM for rendering timber fire-resistant has recently been awarded the Elliott Cresson medal by the Franklin Institute, in consideration of the fact that the invention presents a signal and most notable advance on previously-used methods. The most prominent features of the apparatus adopted by the inventor relate to the means of closing the end of the impregnating cylinder and of filling this vessel with liquid under pressure. The disadvantage of the usual form of hinged door is that it prevents the attainment of sufficient pressure for the thorough impregnation of the wood. In the new apparatus this objection is avoided by means of an internally-seated gate, or valve, operated by hydraulic power, making it practicable to obtain pressures of from 400 lb. to 1,500 lb. per square inch. Again, it is usual to fill the cylinders by high-pressure pumps, the shock caused by which tends to injure the fibre of the timber, particularly at the higher pressures. In the apparatus now under notice an accumulator is used, designed so that it not only maintains a uniform pressure, but serves as a cushion for the pumps and as an indicator for determining the saturation point. In the report published by the Franklin Institute it is stated that by this process a saturation ranging from 25 to 100 per cent. can be secured without apparent detriment to the physical qualities of the wood, and that timber properly impregnated with sulphate of aluminium by the process will resist the point of a Bunsen burner for over eighteen hours—a very much longer time than wood treated by other processes. In our opinion, the great merit of the method is to be found in the mechanical details, which are clearly calculated to facilitate the rapid, thorough, and safe impregnation of the timber for treatment.

The Morris Canal, New Jersey. ONE of the most famous engineering works in the United States is the Morris Canal, constructed about the year 1825, between Phillipsburg on the Delaware River and Jersey City, a distance of rather more than 100 miles. Upwards of thirty-three years ago the canal was leased to the Lehigh Valley Railroad Company, and, in consequence of increasing competition from railways, which in America accept freight at lower rates than do canals, the waterway has been very little used of late. At the present time, in addition to being in a bad state of repair, the canal is an obstacle to much-needed public improvements, and has been condemned in the report of an expert commission. Owing to the growth of vested interests in the United States, it appears that the abandonment of the canal will cause far more trouble and delay than its original construction.

"American Sewer Design and Construction." A PAPER with this title was read by Mr. J. S. Hodgson at the annual meeting of the Incorporated Association of Municipal and County Engineers. It deals almost exclusively with the main drainage works at Boston, Massachusetts, and although in the main English engineers have little to learn from it, there are two or three points which are worthy of notice. One of these is the importance now attached in America to the entire separation of the rainfall from the sewage, although this separation is not completely effected in Boston. The reduction in the size of sewers, which follows from the adoption of the separate system, is of course an important consideration; in the drainage designed by American engineers for the city of Havana in 1900, out of a total of 124 miles of sewers, 89 miles were only 8 in. in diameter. Another point worthy of mention is that the main drainage of Boston and the surrounding towns was undertaken by the State of Massachusetts. This is a method which might with advantage be adopted by some of our

county councils for congested areas, the cost being apportioned between the various districts in which the sewers are laid.

The Hudson River Tunnel.

IN one important respect the tube of the Hudson River tunnel, through which the Pennsylvania Railroad will ultimately pass, differs essentially from those hitherto adopted. The cast-iron rings are to be built up of segments in the usual manner, but at intervals of 15 ft. cylindrical piles will pass through the bottom with a sliding watertight fit, and upon the piles will be supported beams and stringers, together with the rails and ties of the permanent way. As the piles are to be taken down to solid rock or driven to a satisfactory bearing, the permanent way will be independent of the cylindrical shell of the tunnel. The load of the moving trains will be borne directly by the stringers and transmitted by them to the piles. Thus the stringers will act as bridges, and the piles as bridge piers, while the tunnel tube will be entirely free from serious shock and vibration. This method of design is rendered necessary by the unstable character of the river mud in which the tunnel is to be constructed, for, although the silt is of sufficient firmness to keep the tunnel itself in perfect alignment, it was thought that if heavy trains were allowed to bear directly upon the shell of the tunnel their weight and impact would in all probability cause settlement and establish bending stresses that would result in fracture and leakage.

LETTER FROM PARIS.

M. CAVEL, the architect to whom was entrusted the difficult task of enlarging the Bourse without detracting from its architectural harmony, has been awarded the Cross of the Legion of Honour; a well-merited recognition for an admirable piece of architectural work, both as regards design and construction.

Paris offers at present a spectacle which recalls the days when Baron Haussmann was proceeding with his task of transforming the city, after a somewhat too drastic fashion, into its modern aspect. There is not one of the arrondissements which is not at present, at some point or another, turned inside out by the bands of workmen engaged on the Metropolitan railways. But this upheaval of streets, which will in the end prove a public advantage, will not last as long as under the rule of the celebrated Prefect of the Second Empire. The work connected with line No. 2, between the Place de l'Etoile and the Place d'Italie, is now far advanced, but the opening of the line depends on the completion of the viaduct at Passy, the metallic portion of which has been pushed out as far as the centre of the larger arm of the Seine. The finish of the upper works of the bridge will take a year more; and by about September 1905 we may expect to see a train service over the viaduct of Passy. This line will be completed by an embankment from the Place d'Italie to the Pont d'Austerlitz, with a bridge over the Seine which will be completed at the same time as that at Passy. On line No. 3, from Courcelles to Menilmontant, the intermediate stations are finished, and the line may be expected to be opened in October. But the neighbourhood of Père Lachaise has a very treacherous soil, requiring careful treatment which renders the work very slow. The line No. 4, from the Porte d'Orléans to Clignancourt, is in rapid progress at its two extremities; and the centre portion, which runs under the Seine, will be shortly taken in hand. In another quarter, the line No. 5, from the Strasbourg terminus to the Pont d'Austerlitz, is in progress, and completion is promised in 1906, as also with line No. 6, from the Cours de Vincennes to the Place d'Italie. Line No. 7, from the Palais Royal to the Place de Danube, will be commenced next year, as also No. 8, from Auteuil to the Place de l'Opéra. For the moment, this assemblage of railway works causes great inconvenience in the streets. Many omnibus lines have had to alter their routes, many streets are altogether blockaded, and parts of the city are inaccessible except through sloughs of mud.

Works undertaken from purely archæological motives are going on in other places. We have already referred to the excavations which the "Vieux Paris" Committee has been carrying on near the Collège de France. In its turn, the Société de la Montagne Sainte Géneviève has made some interesting discoveries at the Place du Panthéon, at the corner of the Rue d'Ulm, on a site on which have been unearthed vases full of Roman coins, as well as gravestones of the XVIth century, bearing inscriptions in Hebrew characters—a very rare incident among Parisian antiquities.

At another point, the Municipal Administration of Paris is carrying out an excellent piece of work. The Cour de Carrousel, such a mere desert at present, is to be completely transformed in the portion adjoining the Tuileries garden, which is to be continued as far as the wickets leading from the Rue de Rivoli to the quays, and surrounded by a balustrade with the Arc de Triomphe as its centre. It is to be regretted that, while such an improvement is being carried out, there should be constant complaints of the wanton injury done to the statues in the gardens. It has been hitherto impossible to discover the authors of these acts of vandalism; but the mischief has gone so far that the Municipal Fine Arts Department have thought it well to remove from the gardens Carpeaux' fine group of Ugolino and his children, and place it in the Louvre, where it will be secure from such injury as has been done to the marble statues representing "The Nile" and "The Tiber," near the large basin.

At the junction of the Avenue de l'Observatoire and the Rue d'Assas the works have been commenced for the erection of the monument to the memory of Dr. Tarnier. This is the joint design of M. Scellier de Gisors, architect, and M. Denys Puech, sculptor; it consists of a marble bas relief (exhibited at the last Salon), surrounded by an architectural setting in a fine and broad style. The monument is to be unveiled at the end of November.

The Académie des Beaux-Arts has agreed to a proposal emanating from M. Bernier, the architect, that the sum of money intended for the Prix de Rome in painting, which was not awarded this year, should be handed over, as a travelling scholarship, to M. Prévost, a pupil in architecture of MM. Guadet and Paulin, who had previously obtained the second Grand Prix in architecture, but is debarred from competing further owing to his being above the limit of age. The proceeding is somewhat irregular, but it is regarded as an opportunity of recognising and rewarding the acknowledged talent of M. Prévost, who has only been put out of court by a formality.

M. Longerey, architect, has received from the Director of the Department of Assistance Publique a commission to erect, on a site of about 4,000 square mètres formerly occupied by the prison of La Roquette, a block of building containing furnished apartments for bachelors. The Hôtel will contain 840 living rooms, grouped under fifty sections; and around these will be arranged dining-rooms, reading-rooms, baths, etc., for the whole establishment. M. Longerey obtained a premium in the last competition for "Habitations à bon marché," and this building will in fact be the realisation of his competition design.

In spite of the historical and architectural interest of the Château d'Issy, designed by Pierre Bullet, and in spite of the efforts of the Commission des Monuments Historiques, the mandate for its destruction has been given; it is already in process of demolition, and streets are to be laid out over the fine park designed by Le Nôtre. It is likely to be the same with the domain of the Château des Maisons-Laffitte, the work of Mansart, which is offered for sale.

At the Trianon the balustrade of the attic, with its panels of red marble alternating with the colonnettes supporting the decorative vases and figures of cupids, has had to undergo a thorough repair; it was the part of the work that had suffered most from the effects of time. At both the Trianons the necessary repairs have been carried out under the direction of M. Marcel Lambert, the architect who has also had in hand for the last ten years the restoration of Versailles, which it is hoped will be completed this year.

M. Marius Vachon has been claiming for Pierre Chambiges the honour—generally attributed to Boccador—of having been the first architect of the Hôtel de Ville. The question was referred to the Municipal Council of Paris, which has decided to place an inscription on a panel on the building, embodying its architectural history. The Société Centrale des Architectes naturally took an interest in the matter, and their President, M. Nénot, has communicated to the Comité des Inscriptions Parisiennes the following suggested text for the inscription, which will probably be adopted:—

"L'HÔTEL DE VILLE
commencé vers 1533, d'après la modèle
de Dominique de Cortone dit "le Boccador"
Re-edifié ver 1535
sur les plans de Pierre Chambiges
Maistre des Œuvres de Maçonnerie
de la Ville de Paris
continué et achevé en 1628
par Guillaume Pierre & Auguste Guillain
Maistres des Œuvres de Maçonnerie
de la Ville de Paris
Agrandi par Godde & Lesueur
Architectes de 1837 à 1848
Incendié en Mai 1871
a été reconstruit par Th. Ballu architecte
en chef et de Perthes architecte
de 1874 à 1882."

THE BRITISH ASSOCIATION MEETING.

BEFORE coming to the presidential address which served to open the proceedings of the Engineering Section of the British Association meeting on August 18, we think it desirable to make some mention of the address delivered by Professor Horace Lamb to Section A. In some respects this constitutes an answer to the questions brought forward by Mr. Balfour, and which were discussed in our issue of last week. Professor Lamb dealt at length with the part played by Professor Stokes in the development of mathematics and physics, and then examined the points of contrast between modern lines of thought and the teachings of the school of which Stokes may be taken as the representative. In the present day it is no longer thought that the world is constructed in accordance with an absolutely geometrical design, and, as Professor Lamb said, "We no longer hope by levers and screws to pluck out the heart of the mystery of the universe." While recognising the fact that the systems of geometry, of mechanics, and even of arithmetic are merely instruments to aid the study of nature, Professor Lamb holds the opinion, with which most of our readers will probably agree, that it would be quite out of the question to relinquish these aids, and to rely upon mere speculation for knowledge as to the essential nature of matter, and the manner in which it is organised in the world we inhabit. To the scientist, as represented by Professor Lamb, the world has become a more wonderful place than ever, that will supply subjects for scientific research for ages to come. Mr. Balfour, who was present during the address, said that it touched questions that were not merely for the professional mathematician, for they cut down to the very roots of those speculations, to which men were being driven, as to the foundations of our knowledge of the natural world.

The address of Mr. C. A. Parsons to the Engineering Section brings us back from empyrean spheres of thought to the hard details of daily life. Taking "Invention" as its subject, Mr. Parsons pointed out in his opening remarks that a happy change of feeling towards inventors had been evidenced during the last century. Private individuals had devoted more and more time and money to the work, and scientific associations, municipalities, and Governments had afforded valuable facilities for the purposes of research. Such measures as these have undoubtedly furthered the cause of invention, but they have had an even more important result by influencing the application of scientific methods to engineering practice. We are glad to see that Mr. Parsons took exception to the popular idea that invention is a happy thought occurring to an inventive mind. This erroneous notion, we regret to say, is one that seems to prevail among a certain class of professional inventors who make the way of progress more difficult by hawking impracticable or worthless patents in every likely or unlikely direction. Mr. Parsons told his hearers that almost all important inventions had been the

result of training, laborious research, and long-continued labour, and that the after perfection of an invention for general use often involved difficulties as great and required for its accomplishment as much skill as the invention itself. The truth of these remarks is sufficiently proved by the history of the steam engine, the gas engine, the steamship, the locomotive, the motor-car, and, we may add, of the steam turbine, to the improvement of which Mr. Parsons has devoted the greater part of his life. Proceeding to discuss the question of legislative assistance for the inventor, Mr. Parsons asked whether more could not be done for the protection of patentees, and for their assistance when attacking difficult problems. It is certainly the case that the only protection afforded to some valuable inventions is in connexion with details of construction, with the result that those who do most frequently get nothing, some obtain inadequate returns, and only the very few secure satisfactory results. Another point of importance is the absolute indifference exhibited by the British Patent Office as to the novelty of inventions submitted. An enormous amount of time, money, and disappointment would be saved if the practice of the Patent Office in this country were assimilated to that adopted in the United States and Germany, where, as Mr. Parsons pointed out, the patentee is advised after the lodging of his provisional specification of the chief anticipatory patents, dead or alive. The present state of things is humiliating in the extreme for a nation occupying the position that Great Britain does in the world.

After the presidential address in this section, Mrs. Ayrton, M.I.E.E., the only lady who has been admitted to membership in one of the leading engineering institutions of this country, delivered a lecture on "The Origin of Sand Ripples," a subject which has for a long time been in a state of obscurity. By the aid of diagrams and apparatus, consisting of tanks of water with sand in the bottom, the lecturer showed that the forward and backward movement of water over sand would cause small ridges to become visible on the surface and to increase in height and number as the oscillation continued. The fact appears to be that water flowing immediately over any ridge revolves in a spiral vortex, sweeping the sand back towards the ridge, while the higher water falls down over the vortex and brushes the sand forward away from the ridge, so that at a certain point the sand is being swept in both directions. At this point there is the beginning of a new furrow, while the sand brushed up by the water flowing obliquely over the vortex forms the nucleus of a new ridge. One inference to be drawn from the observations of Mrs. Ayrton is that, contrary to accepted opinion, a steady flow of water in one direction cannot produce sand ripples, but will obliterate any such previously existing in the sand over which it passes. We ought here to refer to the lecture delivered on the succeeding evening by Professor George Darwin, on "Ripple Marks and Sand Dunes," a subject including that already discussed. The lecturer, as mentioned by Mrs. Ayrton on the previous evening, took the first step some twenty years ago towards the elucidation of the genesis of sand ripples, and his recent lecture explained how ripple marks might be produced in a circular vessel containing water and a layer of sand, the effect being due to eddies in the water. The theory of Professor Darwin is similar to that of Mrs. Ayrton, except that his demands two eddies for the production of a sand ridge, while hers requires but one eddy. The more important part of Professor Darwin's lecture was devoted, however, to the discussion of sand dunes, formed by the eddies in moving air and water. Some of the dunes described and illustrated are waves of inequalities transverse to the wind, and others are longitudinal. The practical utility of this subject is sufficiently obvious, for the protection of cultivated land from the encroachment of sand and the control of drifting snow are matters frequently demanding the attention of agriculturists and others. During the same day the Engineering Section was mainly occupied with the discussion of problems connected with internal-combustion motors. Mr. Dugald Clerk first read a paper entitled "Flame in Internal-Combustion Motors," this being undoubtedly the most important point at present demanding inquiry by those engaged in the design of such engines. As in the James Forrest lecture, reviewed in our columns a few weeks ago, Mr. Clerk invited the aid of the physicist for the accurate determination of flame temperatures, an operation of great difficulty and upon which available data are very incomplete. It is satisfactory news that a committee of the Institution of Civil Engineers has been appointed to consider the whole question of the thermo-dynamic standard for internal-combustion motors, and we join with Mr. Clerk in hoping that the committee will also make it their business to deal with flame temperatures and their determination.

Professor Harold Dixon contributed a paper on "Exhaust Gas Calorimetry," dealing with the specific heat of gases at high temperatures, and expressing the opinion that carbonic monoxide could not be consumed at very high temperatures, as dissociation would thereby be effected. During the course of the subsequent discussion Sir Andrew Noble stated that in experiments he had made at high pressures the specific heat of gases had not varied so much as he had expected; but the fact that variation was observed is a confirmation of the German conclusion, expressed by Dr. Schröter, that specific heat depends upon pressure as well as upon temperature.

One of the most interesting papers read at the Monday sitting of the Mathematical and Physical Section was that of Dr. Glazebrook on "The National Physical Laboratory." A valuable work brought to a successful termination in that institution is the construction of a number of mercury standards of resistance. Dr. Glazebrook commented upon the fact that, although the Electrical Standards Committee of the Board of Trade had recommended "that a material standard constructed in solid metal should be adopted as the standard ohm, and should, from time to time, be verified by a column of mercury of known dimensions," the first opportunity for such verification was only afforded ten years later through the instrumentality of the National Physical Laboratory. The announcement was made in the same contribution that the law had been there deduced "that on similar structures the resultant force due to a uniform wind is simply proportional to the square of the linear dimension." The attention of manufacturing engineers was particularly directed to the facilities offered by the laboratory for the solution of problems occurring in everyday work. Some instances of such assistance already afforded were mentioned by Dr. Glazebrook, among these being examination of the causes producing differences in the tensile strength of steel test-pieces cut from different parts of a plate, investigation into the effects of violent shear on an iron plate, the experimental explanation of difficulties in making bronze castings, and work in connexion with the photometry of electric lamps. For the purpose of assisting engineers to secure interchangeability in screws, a special lathe has been built under supervision by Messrs. Armstrong, Whitworth, and Co., and this lathe is now installed in a constant-temperature building at the laboratory. Dr. Glazebrook stated in his paper that examination of the screw of this lathe showed that the error nowhere exceeded 0·0001 in. in the 3 ft. of its length. This is a result of which the designers and makers may well be proud. A striking proof of the practical value of the National Physical Laboratory is afforded by the following extract from a German technical publication:—"Our German instrument-making trade has every cause to watch carefully the development of the National Physical Laboratory, and to take timely precautions before the advantage which it has already secured against English competition are too seriously reduced." Sentiments of this kind show at once the keen perception of the intelligent foreigner and the advisability of supporting more liberally the institution under the competent direction of Dr. Glazebrook.

Passing now to the meeting of the Engineering Section on Monday, we find that electricity formed the basis of all the papers and discussions. Mr. A. A. Campbell Swinton first read a contribution on "Electricity from Water Power," a subject which we are glad to see brought into prominence. At the present time it appears that the total capacity of the hydraulic electricity works in Great Britain is not more than 11,900 h.p., of which 7,000 h.p. is represented by the plant of the British Aluminium Company at Foyers, N.B. This installation is now being enlarged, and Mr. Campbell Swinton says that in the course of a month a further output of 2,000 h.p. will become available. A most interesting project now in course of realisation is that of the North Wales Electric Power Company, whose first installation will derive power from Lake Llydaw, on Snowdon. This lake, receiving water from Lake Glaslyn, has an area of 5¼ million sq. ft., and a catchment area of 1¾ square miles in one of the most rainy sites in Europe. By the construction of a dam, the surface of the lake will be raised about 20 ft., and water will be drawn through a tunnel 600 ft. in length. The total fall utilised will be over 1,100 ft., and it is estimated that 8,200 h.p. will become available. The same company also propose to establish a similar plant in the Conway valley, with nearly double the horse-power of that on Snowdon. Another extensive scheme, involving about 6,000 h.p., has been projected in connexion with Loch Sloy, between Loch Long and Loch Lomond. The object of this enterprise is to generate and transmit energy at 40,000 volts to the industrial areas along the Leven and the Clyde, including the towns of Dumbarton, Helensburgh, Renton, and Alexandria. The foregoing memoranda serve to indicate that efforts are at last being made to utilise natural sources of power in this country. Mr. Hawksley and General Webber, speaking in the discussion of the paper, were quite right in saying that in Great Britain difficulty may be experienced in securing continuous supplies of water for power purposes, but that is no reason why the best use should not be made of all the suitable sites. Messrs. C. H. Merz and W. McClellan next read a joint paper on "The Use of Electricity on the North-Eastern Railway." The authors gave a useful account of the power station and system adopted in the Newcastle district, and pointed out that the Company, instead of endeavouring to retain the short-distance passenger who is now attracted by electric tramcars, intend to develop suburban traffic, and to deal as efficiently as possible with inter-urban traffic. As we have remarked on previous occasions, the North-Eastern is one of the most enterprising among British railway companies, and the programme here indicated shows that the conditions that will govern traffic in and around large towns and cities have been intelligently appreciated. The remaining papers brought before the section on Monday need not be specifically mentioned, as they related to special branches of inquiry chiefly interesting to engineers concerned in the design and manufacture of electrical machinery.

On Tuesday, those attending the meeting of the Engineering Section had an opportunity of listening to the views of Sir Hanbury Brown, on "The Control of the Nile." The author is one of the small band of Anglo-Indian irrigation engineers who joined the staff of Sir Colin Scott-Moncrieff in 1884, and has been connected with the Egyptian Irrigation Department until his retirement this year. Egypt owes much to the energy and skill of Sir Hanbury, who was the first engineer to deal effectively with the Nile flood, and who, by the construction of the Delta subsidiary weirs, increased the head of water held up by the barrage from 13 ft. to 20 ft. As a review of the means adopted up to the present date for making Egypt "produce more," the contribution to which we now refer may be studied with advantage by all who are interested in the subject. Comparatively little is said concerning the new projects discussed in our issues of last and this week, apparently because the paper was written before the publication of Sir William Garstin's Report, and for the reason assigned by the author that more detailed consideration of these schemes would extend beyond available limits. Sir Colin Scott-Moncrieff remarked during the discussion that Egypt was really a small country, for the desert on either side of the Nile Valley was no more a part of the land of Egypt than was the surrounding ocean a part of England. The view of Egypt thus presented helps to make clear the extremely remunerative character of irrigation works in that country, and at the same time points to the limited area within which such undertakings are practicable. A somewhat similar branch of engineering was brought before the same sitting by the report of the Mersey Tidal Régime Committee, read by Mr. J. N. Schoolbred, the secretary to that body. From analyses prepared by Mr. Edward Roberts, of the Nautical Almanac Office, it appears that the tides at Liverpool have scarcely undergone any change during the past forty years. This conclusion is confirmed by the comparative examination, made by Mr. Schoolbred, of the tidal curves themselves for the years 1903, 1893, and 1874. In addition to their general interest, these results ought to be

of value to the port of Liverpool. We come next to a paper having particular bearing upon the practice of our readers. This contribution was one by Mr. J. H. Wicksteed, descriptive of "A Universal Testing Machine of 300 Tons for Full-sized Structural Members." Although it can be scarcely supposed that a machine of this type will be largely used by building contractors, or included among the instruments thought necessary for the equipment of an architect's office, the results obtained by its aid in testing establishments will be available to all. The machine described will admit columns 88 ft. long by 3 ft. 3 in. square in cross section, or beams 20 ft. between supports by 6 ft. 6 in. deep by 3 ft. 3 in. wide. It will sheer 8-in. by 2½-in. bars of mild steel, and break steel wire ropes of 3 in. diameter. The apparatus makes autographic stress-strain diagrams for all such tests, and its sensibility, with a pull of 100 tons, is stated to be 1 in 10,000. The desirability of employing a machine for full-sized tests in preference to ordinary loading becomes obvious when it is remembered that the cost of 300 tons of accurate dead-weights would be more than 2,000*l.*, while the cost of applying them would be very heavy. The next paper, by Professor J. O. Arnold, dealt with the fracture of structural steel under alternating stresses. By means of a machine devised by the author, the remarkable fact was elicited that the resistance of structural steel to rupture under rapidly alternating stresses was inversely proportional to the rate of alternation. Another important result of the tests was the observation that one side of the plate became brittle and the other tough under alternating stresses, and the author arrived at the conclusion that, when steel had once acquired distinct brittleness, it could not be restored by heat treatment short of re-melting. Mr. R. A. Hadfield afterwards brought forward a paper on the "Production of Magnetic Alloys from Non-Magnetic Metals," exhibiting a sample of an alloy composed of copper, aluminium, and manganese. The author demonstrated the magnetic character of this specimen, much to the surprise of his audience. As an alloy of copper and aluminium is non-magnetic, the contributing cause of the anomalous result mentioned must be manganese. That manganese should have this effect is extremely curious, for it is known that this metal will transform steel from a highly-magnetic to a non-magnetic substance. Another singular circumstance noted was that, while the manganese produced magnetic properties, the characteristic of reversibility appeared to be due to the aluminium. The startling discovery discussed by Mr. Hadfield, and stated by him to be really due to Dr. F. Heusler, adds one more to the many obscure points connected with the magnetisation of metals. After the reading of a note by the same author on the mechanical properties of iron and its alloys at very low temperatures, the business of the Engineering Section was brought to an end.

Speaking generally upon the business of this department of the meeting, we may say that, with the exception of two or three contributions, there was no attempt to present engineering science in a popular form. Although not calculated to interest the general public, this course is in every way commendable as conducing to the objects for which the British Association was founded. The authors of papers, as well as those members who took part in the discussions, devoted their attention to the consideration of practical science, and showed no disposition to be led away into the realms of speculative philosophy so strongly evidenced by Mr. Balfour's address and by the proceedings of more than one section of the recent gathering.

THE ACTION OF LIGHTNING STROKES ON BUILDINGS.*

IN a paper entitled "The Protection of Buildings from Lightning," which was read at the Glasgow meeting of the Association in 1901, the author mentioned the establishment of the Lightning Research Committee, organised jointly by the Royal Institute of British Architects and the Surveyors' Institution, who have since investigated a very large number of occurrences from the reports furnished by their observers. It was decided after the first year to confine the Committee's investigations to buildings which were fitted with conductors, and, following this course, the reports on about forty protected buildings affected by lightning have been summarised by a sub-committee, and are having the attention of the General Committee, who will in due course issue a report.

The principal causes of the failure of the usual style of lightning rod as fitted on the buildings investigated appear to be due to the following:—(1) Insufficient number of conductor and earth connexions; (2) the absence of any system of connecting the metallic portions of the buildings to the lightning conductor, especially the interconnexion of the finials, rain-water pipes, and gutters. In the author's opinion the frequent damage by side-flash from the conductors might be lessened by running a horizontal conductor along the ridge, or along the parapets of all the roofs, somewhat after the method which is almost universally adopted in Central Europe.

The lightning strokes may be divided into three classes:—(1) Those where the conductor conveyed a portion of the flash to earth, but the side-flash to other unearthed metallic conductors damaged the building; the practice of running the conductor round the projecting masonry, often taking sharp bends, doubtless facilitated the deviation of the current from its direct path to the earth. (2) In several observations a metallic roof of large area received the flash, consequently became highly charged, and the single conductor failed to convey the whole of the stroke, a portion of which took a circuitous path—for instance, through a speaking-tube and an electric bell wire. (3) A flash struck the building at two points simultaneously, a lightning conductor taking one part of the stroke, but damage was caused by the other portion selecting an unprotected part of the roof.

Earth Connexions.—With a few exceptions these had the defect common to nearly all earth-plates which are simply buried in the ground close to the foundations of a building, and owing to drainage soon became dry, consequently are of very high resistance. Architects as a rule object to sufficiently deep holes being made near a structure; consequently the permanently moist ground is not reached. The tubular earth designed by the author does away with this objection, and can be kept moist by leading a small tube to the nearest rain-water pipe.

Interconnexion with the Metal Work of a Building.—Although the utility of the external metal was specially put forward in the report of the Lightning Rod Conference in 1882, their recommendation has been apparently disregarded in all the cases under review. The Cavendish Laboratory (No. 64) stroke, which was fortunately unattended with danger owing to the gas in the gas-pipe which formed the path of the current being turned off, would not have taken this circuitous path had the leaden roof been connected to the conductors which ran down the tower only, also to the rain-water gutters and pipes, which should have been interconnected at the bottom and properly earthed. Again, at Bedford (No. 88) last year, St. Paul's Church was seriously damaged by the flash leaving the single conductor on the tower by the water on the roof and passing thence to earth by means of the rain-water pipes. In this case it is interesting to note that the lead pipes were not fused, but their round section was changed into an oval one; the iron water-pipes were broken. This incident and No. 68 (St. Pancras Church, Euston) show clearly that the damage was due not to direct stroke, but by a portion of the flash leaving the main conductor and taking a circuitous path round the unconnected metal work outside and inside the buildings.

Observation No. 2: Kea Church, Truro.—The copper sheathing of the spire, owing to its great capacity, could not discharge through the one excellent conductor to earth, consequently the flash divided, part going by the conductor and part by the alternative path formed by the copper covering of the spire to a rain-water pipe, thence sparking through a parapet wall to lead flashing down another pipe, and then along a very small copper wire used for training plants, to the main conductor. Similar effects were noted in Stoers Lighthouse (No. 54) and Devaar Lighthouse (No. 56), the divided flash in the former leaving the conductor for a telephone wire and in the latter for a speaking-tube. In these observations the conductors may be said to have acted to a certain extent, and if the structures had been entirely unprotected the damage would have been greater, but by proper attention to the necessities of each case, and increasing the number of the conductors, the risk would probably be nil, as there would be a definite path for the lightning to take.

Quite the most interesting case is that at Possingworth House (No. 67), struck in June and again in August, 1902, although the roof fairly bristled with air terminals, every chimney being protected, mostly with its own conductor and earth connexion. It is probable that on the second occasion the flash divided, one part selecting a chimney stack, which it damaged, bending the air terminal to an angle of 45 deg., while the other, neglecting the many points, fell on an unprotected statue much lower than the chimney and went to earth by the iron frame of a conservatory, showing the unreliability of a number of independent conductors which should have been interconnected by means of a horizontal wire led along the ridge; this would in all probability prevent any serious damage.

Sir Oliver Lodge has shown by an interesting experiment that a column of hot air is often selected by a flash although a lightning rod may be affixed to the side of the chimney. Most of our large stacks have a band of metal to which the air terminals are fitted, and from these two conductors should be led to earth. The method adopted in Germany appears to be simpler, and consists of a heavy iron frame rising to a sufficient height above the stack, and continued at the apex so as to form an aigrette. That lightning may prefer the smoke issuing from a chimney was shown by the stroke at the East London Waterworks, Sunbury, last year, the flash doing some damage to the capping before it arrived at the standpipe inside, which was a perfect earth in that it was in direct connexion with the company's mains.

The general conclusions arrived at by the author are that there is very little advantage in placing isolated rods on an ordinary building unless it has a high tower. A church, for instance, with a spire should have at least two conductors from top to earth. Even then, if any other part of the structure happens to be in the path of a discharge from a cloud to the ground, the stroke may disregard the protected towers or spire and fall on the building, choosing some lower point. If the suggestion put forward by Sir Oliver Lodge at the Bath meeting in 1888 were more closely followed, and the conductors so arranged that they form a protective network over all the roofs, a flash would in all probability be received by some portion of the system and pass without harm to the ground by one of the numerous earths to which the network would be connected.

The insurance offices appear to disregard the question of adequate protection, and are quite content if the single conductor which has not prevented serious damage, for instance, to a church is replaced, and, moreover, take no steps to have the earth connexion tested periodically; also the few unconnected lightning rods erected on our national museums, picture galleries, and other public buildings contrast most unfavourably with the more scientific methods adopted on the Continent, more especially in Germany, where in some districts the local authorities have issued rules as to the erection and testing of lightning conductors, to which the various public bodies have to conform, and in some cities householders are subject to penalties if the system is allowed to get out of order.

TIDESWELL CHURCH RESTORATION.—One of the most important undertakings in connexion with the restoration of the ancient church at Tideswell has just been carried out—viz., the removal of the modern gallery, erected about 1826, and which so disfigured the west end of the church. The noble tower arch, the beautiful transitional window, and the groined arch are now once more revealed to view. The work of removal of the gallery and north porches has been voluntarily done. The removal of this gallery has revealed little of interest in the way of antiquity. A "squint," a few feet above the belfry door, has been reopened, and in several places the walls show signs of ancient decoration and inscriptions. Two boards found bear angels' heads painted thereon. The gallery for the most part was not of that substantial character as was anticipated, and some of the timber was quite rotten and not removed too soon. The architect for the work is Mr. J. Oldrid Scott, of London. The work of preparing the carved oak porches is being pushed on with.—*Derbyshire Advertiser.*

* A paper, written for the British Association meeting at Cambridge, by Mr. Killingworth Hedges, M.Inst.C.E., Hon. Secretary Lightning Research Committee, Royal Institute of British Architects.

RESERVOIR CONSTRUCTION.*

Storage Reservoirs with Earthen Embankments.

(*a*) *The Impervious Core below Ground. Various types of Construction and their Cost.*—This point has been dealt with since concrete has on more than one occasion recently been declared to be the cheapest type.

Owing to the great uncertainty as to the permeability of the natural strata on the water side of the core and for other reasons, this cannot be designed on rational lines, hence there are numerous types of construction, differing very widely, evolved mostly from the accumulated experiences of various practitioners. It may consist of rubble masonry (a type very little used in this country); cement concrete; lime concrete; clay puddle; or a combination of puddle with concrete or brickwork. When formed of concrete (the concrete, of course, stopping some distance before the surface is reached), the core is, in the majority of cases, about 6 ft. wide till it widens out upwards, either by battering or stepping, to receive the superposed puddle core and consists of either 5 to 1 cement concrete or 4 to 1 lime concrete with the matrix richer at wet spots. When formed of clay puddle the core has a surface width equal to one-fourth to one-third of the depth of water impounded, and reduces downwards rapidly till a minimum width of from 10 to 12 ft. is reached, after which it is parallel. In many cases the puddle rests on a concrete shoe.

Another type of puddle core is protected on the sides and bottom by means of concrete. Besides the above main types of construction there are, of course, numerous minor types. In considering the costs of the various types, it will be assumed that concrete materials and puddle can be obtained at reasonable prices. Assuming a depth of water in reservoir of 70 ft. and a depth of trench of 60 ft., the cost per lineal yard of the various types of construction would be approximately as under† :—

CEMENT, CONCRETE TYPE.

	£	s.	d.
Excavations, including pumping, 55 cubic yds. at 6s.	16	10	0
Timbering, allowing for reselling, 160 cubic ft. at 1s. 3d.	10	0	0
Cement concrete (5 to 1), 38 cubic yds. at 16s.	30	8	0
Clay puddle to surface, 17 cubic yds. at 4s. 6d.	3	16	6
Total per lineal yard	£60	14	6

LIME, CONCRETE TYPE.

Cement, concrete type as above	60	14	6
Deduct difference in concretes, 38 cubic yds. at 4s. 6d.	8	11	0
Total per lineal yard	£52	3	6

CLAY PUDDLE TYPE (10 ft. trench).

Excavations, including pumping, 73 cubic yds. at 5s.	18	5	0
Timbering, allowing for reselling, 180 cubic ft. at 1s. 3d.	11	5	0
Clay puddle, 73 cubic yds. at 4s. 6d.	16	8	6
Total per lineal yard	£45	18	6

CLAY PUDDLE TYPE, WITH CONCRETE SHOE.

Clay puddle type as above	45	18	6
Extra value of concrete over puddle, 5½ cubic yds. at 12s. 6d.	3	8	9
Total per lineal yard	£49	7	3

COMBINATION TYPE OR PUDDLE SANDWICHED BETWEEN CONCRETE.

	£	s.	d.
Excavations, including pumping, 65 cubic yds. at 5s.	16	5	0
Timbering, allowing for reselling, 168 cubic ft. at 1s. 3d.	10	10	0
Concrete (5 to 1), 39 cubic yds. at 17s. 6d.	34	2	6
Clay puddle, 26 cubic yds. at 4s. 6d.	5	17	0
Total per lineal yard	£66	14	6

From the above it will be seen that under no ordinary circumstances can the "concrete" type be cheaper than the "puddle" type. There can be little doubt, however, as to the superiority of the "concrete" type, but numerous failures emphasise the absolute necessity for the employment of the highest qualities of materials, workmanship, and supervision in its construction, and in the case of direct labour the supervision should be more efficient than if the work were contracted for. Unless the above conditions can be absolutely guaranteed, clay puddle forms by far the safest filling for the trench.

(*b*) The enormous depths to which some reservoir trenches have recently been sunk, and the element of uncertainty as to their efficiency even after these great depths have been reached, especially in twisted strata, have led the author to consider whether the reservoirs could not have been constructed more economically and efficiently by methods not involving trench sinking. Several such cases have been investigated following the method adopted in tightening the Randymere Reservoir, Whitby, and the author found that after making large allowances for contingencies this method of construction came out much cheaper than any other.

The following are some of the advantages possessed by this method, viz. :—

1. The embankments do not require any fine selected material, in fact, the stonier they are the better, and therefore are very cheap to construct; moreover, as the inner slope is not saturated with water, the section of the embankments can be much reduced.

2. The reservoir is much cleaner, and there is no trouble with vegetation on the banks; shallow parts at the upper end can be readily cut off so as to increase the average depth.

3. Reservoirs could be constructed irrespective of the geological strata. Thus many favourable sites for reservoirs could be utilised where it would be hopeless to attempt to make reservoirs in the ordinary way.

In too many cases the location of reservoir embankments is determined entirely from surface indications, the underlying strata being guessed at from the small portions of comminuted strata withdrawn from boreholes of small diameter, the engineer trusting to luck to find a decent bottom at a reasonable depth. Trial shaft sinking (by which alone a sound judgment can be made) is frequently postponed till the water authority is committed to a contract and as a fresh site means a fresh Act of Parliament, the site is adhered to, no matter what the final cost of the structure may be. The author believes that in such cases the above method of construction will often well repay investigation.

(*c*) *Position of Valve Shaft.*—The valve shaft is frequently built almost entirely exposed, but for economy with equal efficiency it should undoubtedly be placed entirely in the solid ground for the following among other reasons, viz. :—

If exposed, it means that the shaft is usually an ornamental octagonal tower of masonry, and in order to secure water-tightness under the extremes of temperature, the shaft must be lined with cast-iron cylinders; a long foot-bridge is also necessary as an approach. There have also been cases of the valve tower being injured by movement of the earthwork of the embankment. All the above contribute to render an exposed valve shaft very expensive, and it possesses no advantage whatever over a shaft built entirely in the solid. The valve shaft should be built immediately on the water side of the impervious core of the embankment; a little scheming will generally determine suitable positions for the various draw-off pipes without much disturbance of the natural strata.

(*d*) The great variation in the top width of puddle walls calls for comment. The top width in many of the older reservoirs was only 4 ft., while during the last ten years in deep reservoirs where first-class puddle and backing have been used, the top width has varied from 6 to 14 ft. —the latter being surely very extravagant. The amount of cover given to the puddle wall is also most important. In many large reservoirs it is as small as 14 in., which is far too small considering the great danger of the puddle wall cracking, and the comparatively trifling expense of adding a foot or two to the height of the embankment.

So great is the danger should a drought be succeeded by a very heavy flood, as happened in the north of England a few years ago, that the author believes it would be worth while to have a pipe laid across every important embankment, so that the roadway might be kept moist in dry weather, and so keep the top of the puddle wall in good condition. The cost of this in most cases would be infinitesimal, as springs can be caught on the higher ground near most embankments. The same idea could be applied to masonry dams where so severe stresses are developed in the masonry by changes of temperature. A stream of water could be kept flowing continually over all exposed masonry. The water thus flowing out of the reservoir would not be wasted, as it would form part of the compensation water.

(*e*) Within the last nine years there have been constructed three reservoirs at the terminations of three of the largest aqueducts of this country, the capacities varying from 700 to 120 million gallons. The types of construction are: (1) earthen reservoir, with puddle wall, lined on embankments only; (2) concrete reservoir, with vertical retaining walls and brick and asphalte lining; (3) earthen reservoir, with puddle wall, completely lined with concrete and pitching.

Considering that all three waters are practically identical in character, it seems strange, in view of the enormous economies possible by the adoption of the first type, that the other two types should have been used, particularly the second, the author not being aware that there is any advantage in vertical walls. Doubtless "circumstances alter cases," but there is a limit to the application of even that truism.

(*f*) Till recently the author was led to believe that the advantage of numerous decanting pipes in deep reservoirs was universally admitted, but having occasion to visit a deep reservoir under construction he found that the whole of the water was intended to be withdrawn from near the bottom, and he would be glad to hear this point discussed.

Service Reservoirs.

(*a*) *Circulation of the Water.*—Too little attention seems to be given to the prevention of stagnation of the water in service reservoirs in this country; on the other hand, some foreign engineers seem to have gone to the other extreme.

In some cases for the sole object of cramming all the valves together, the inlet and outlet pipes are within a few inches of each other, with the result that there is no chance of circulation.

Considering the small extra expense involved the inlet and outlet pipes should be so arranged that there is as much circulation as possible. The inlet pipe should discharge well below the surface, and if there are several inlets and outlets they should be spaced well apart and at various levels. Floating outlets are sometimes used in covered service reservoirs, but the author believes that, generally speaking, these are a mistake. Very often the water entering a covered reservoir is slightly warmer than that in the reservoir owing to its passage through a surface condenser or exposure to the air, and hence has an inclination to rise to the surface. The result is, that if a floating outlet is used, the incoming water is skimmed off without mixing with the rest. Generally speaking, unless there is a great deal of suspended matter in the water, floating outlets should not be used, as most service reservoirs are sufficiently shallow to preclude the possibility of the upper part of the water being superior in clearness to the lower part in any perceptible degree.

(*b*) *Ventilation of Reservoirs.*—The author believes that in many cases too much ventilation has been provided for covered reservoirs, as there is the chance of objectionable matter being introduced through them. To guard against this, it has been proposed to put some filtering material for the air into the ventilators.

Generally speaking, the capacity of service reservoirs is such that with even the maximum rate of inflow the water level rises very slowly and forces the air very gently through the ventilators, and there is exceedingly little risk of any dangerous uplifting effect on the roof. It hence seems rather absurd to see, as are sometimes seen, as many as thirty ventilators on a small reservoir.

NETHY BRIDGE INSTITUTE, N.B.—The new institute which has just been built at Nethy Bridge was opened recently. The institute contains two recreation-rooms, which can be united in one for meetings, the hall being then capable of seating 250 people. There is also a library and reading-room, etc. The building was designed by Mr. Mackenzie, architect, Edinburgh.

CONGREGATIONAL SCHOOLS, BRIGHTSIDE, SHEFFIELD.—On the 25th ult. the foundation-stones of new Congregational Sunday schools were laid. The site is at the rear of the present chapel, and it has been decided to erect a large assembly hall, 50 ft. by 28 ft., with a gallery at one end. There will be eleven smaller rooms, including a library, a young men's room, and young women's room. The other eight rooms will be utilised as classrooms for the scholars. The building is constructed to accommodate 500 persons. Messrs. Henry Boote and Son are the contractors, and Messrs. C. J. Innocent and Son the architects.

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* A paper by Mr. G. Mitchell prepared to be read at the Annual Meeting of the Incorporated Association of Municipal and County Engineers, held at Shrewsbury, July 14, 15, and 16.

† These costs are to be taken as applying to no particular locality but as rough general averages for comparative purposes.

JASPER AS A BUILDING STONE.

In the works of classical writers, jasper is described as a translucent stone, generally of an emerald-like green. Most probably the jasper of the ancients included stones now regarded as varieties of chalcedony and agate. But, in addition to the stone intended in the account of that city whose light was said to be "like unto a stone most precious, even like a jasper stone, clear as crystal," there was a variety known as Egyptian jasper, much used in ancient art, and found near the Nile in nodules having bands of red, yellow, or brown. According to modern nomenclature, jasper is an impure form of silicon dioxide, and may be defined as an opaque, close-grained variety of quartz, the colour of which is red, brown, purple, heliotrope, or old gold. The most usual colours are red and brown, the former due to the presence of peroxide of iron and the latter to the same oxide in a hydrated condition. The modern jasper is found on a large scale in the Lake Superior district, and has been known to exist in very considerable quantities in Scotland and North Wales. Practically no use of this beautiful material has been made in decorative and constructional building work, owing to its exceptional hardness, which is quite ten times that of granite, and renders impossible any efficient treatment by the ordinary tools of the stone-cutter.

By means of a newly-patented method, however, it is possible to work the stone without difficulty, and we had an opportunity last week of witnessing some practical tests of the first machine erected in this country for dressing and moulding stone under the system in question. This machine, invented by M. Jaspart, of Paris, has been installed at the works of Messrs. Kirkpatrick Brothers, Trafford Park, Manchester, these works being operated in conjunction with the business of the Jasper Company, of London. The general construction of the machine will readily be understood by the following description. It consists of two parts, the first being a heavy vertical frame resembling that of a drilling or boring machine, and the second includes a horizontal bed like that of an iron turning-lathe, having a reciprocating table upon which the stone is clamped. The vertical frame is fitted with a spindle driven by means of a belt at a speed of 2,000 revolutions per minute, and the lower end of the spindle is screwed for the attachment of an abrasive wheel, composed of corundum and other substances. The wheels can be made of any desired proportions and shape to suit the class of work and the thickness of the slab to be dressed or moulded, and the spindle can be raised or lowered as desired within certain limits. The horizontal bed is fixed in front of the frame carrying the abrasive wheel, so that the reciprocating table, with a movement resembling that of a planing-machine bed, may cause the whole length of the stone to pass in front of the wheel for treatment. For the purpose of adjustment, the upper end of each of the two pedestals supporting the bed is cast in the form of a socket, which is bored out to fit the turned end of a pillar secured to the under-side of the bed. Consequently, the height of the reciprocating table can be raised or lowered to suit the thickness of the stone to be worked. The table has an angular adjustment for champering the edges of slabs, and is provided with screw gear very similar to that of a slide rest, so that the stone can be brought up to the abrasive wheel, and drawn away from it when the work has been finished. This transverse movement would enable the attendant to regulate the depth of each cut at will, but, in practice, the cut is automatically regulated, the depth being $\frac{1}{16}$ in. for each longitudinal travel of the table. The forward and backward motion of the table is effected by means of a screw fitted in the horizontal bed and connected with a shaft driven by one of two belts, one open and the other crossed. Reversal of the motion of the table takes place automatically at the end of each stroke, when an arm projecting from the under side of the table comes into contact with a collar attached to a horizontal rod connected with the striking gear of the driving belts. A loose pulley is fitted between the two driving pulleys, but the motion of the travelling table can be instantaneously stopped by a lever, which disengages the nut working along the actuating screw in the bed. It will be seen from this description that after the slab of stone has been correctly placed in position, the whole of the operations are automatically conducted. The only work left for the attendant is to look on and at the proper time to stop the machine, when the moulded slab can be taken away.

During our recent visit to Trafford Park, this machine was tested with various kinds of stone, including Portland stone, Carrara marble, Mexican onyx, and red Welsh jasper. The object in each case was to form a 2-in. decorative mould on the face of the slab, and the results are briefly stated below:—

Portland stone.—Length of slab, 5 ft.; speed of travel, 6 ft. per minute; depth of cut, $\frac{1}{16}$ in. Time occupied, 9½ minutes.

Carrara marble.—Length of slab, 18 in.; speed of travel, 6 ft. per minute; depth of cut, $\frac{1}{16}$ in. Time occupied, 6½ minutes.

Mexican onyx.—Length of slab, 3 ft.; speed of travel, 6 ft. per minute; depth of cut, $\frac{1}{16}$ in. Time occupied, 10 minutes.

Red Welsh jasper.—Length of slab, 2 ft. 6 in.; speed of travel, 6 ft. per minute; depth of cut, $\frac{1}{16}$ in. Time occupied, 48 minutes.*

The quality of the work performed is excellent, the surface being geometrically true, and so smoothly finished that no further dressing is requisite beyond the raising of the polish. In the case of the Mexican onyx, the result was particularly satisfactory, especially as this stone invariably presents flaws, which constitute a serious obstacle to shaping by hand tools. As may be expected, the working of hard stones must cause a certain amount of wear on the periphery of the cutting wheel, but in the ordinary way the only evidence of this is a slight reduction of diameter in course of time. If, however, the shape of the mould becomes altered owing to the presence of exceptionally hard layers or bands in the stone, the original profile can quickly be restored by re-turning in a lathe. We may here mention that the abrasive wheels are usually supplied by the patentees in cylindrical form, the moulds required being cut at the works of the user. The new machine is said to be equally suitable for working granite, the speed of travel for this stone being 3 ft. per minute. It is curious that the speed for jasper (6 ft. per minute) should be the same as that for Portland stone and marble, and it would be interesting to know the reason for this apparently anomalous circumstance. The Jaspart machine is made in various sizes for working table tops, mantel pieces, and small architectural details, and, as in the case of the machine here described, for dealing with slabs weighing several tons.

We are informed that further adaptations of the abrasive compound are contemplated, and that it will be applied to saw blades, rubbing beds, and other stone-working appliances. Jasper is now being quarried on an extensive scale at Aberdaron, not far from Braich-y-Pwll, the "Land's End" of North Wales, and it is believed that the further development of the patent to which we have alluded will render generally available a new building stone, combining more beautiful colouring than marble, and possessing greater strength and better weathering qualities than granite.

* Owing to lack of time, we were only able to be present during the first fifteen minutes of this test.

THE KLEINE FLOOR SYSTEM.

Many patented systems of floor construction suffer from the drawback that they involve the employment of specially-manufactured sections of steel and of special forms of brick, terra-cotta, or similar materials. When this is the case, the cost of construction is undesirably increased by the conveyance of materials to the site, as well as by the comparatively high prices of special products. The essential features claimed for the type of flooring here described are:—(1) That, as ordinary bricks and simple sections of steel are employed, the cost is reduced to a minimum; (2) that the floor can be built in wide spans without the aid of joists, thus saving their cost; and (3) that it possesses in a marked degree fire-resisting and sound-resisting properties. Although quite new in the United Kingdom, the Kleine floor has been largely used in Germany for the past twelve years, and we are informed that the imperial and municipal authorities have adopted it very extensively in Berlin and elsewhere in Germany.

On Tuesday last we availed ourselves of an opportunity of inspecting the construction of three spans of this flooring, one of 16 ft. and two of 6 ft. 9 in. between supports. The method followed is extremely simple, and, when the details have once been settled by the architect, any bricklayer can perform all the work required with the greatest ease and rapidity. Let us assume that a floor panel has to be built between two main girders placed 16 ft. apart. In the first place, the lower flange of each girder is enclosed by a strip of expanded steel or galvanised netting. Then a light platform is formed over the area to be covered, for the temporary support of the work, this platform being of boards which need not be nearer to each other than, say, 1½ in., and its upper surface being about an inch lower than the under side of the girders. A course of bricks on edge is then laid in cement mortar between the girders, the two end bricks being roughly rebated, so that the under surface of the course may lie on the supporting platform, and thus project below the level of the flanges of the girders. A strip of steel, say, 2 in. wide by ⅛ in. thick, is next placed along the side of the course of brickwork upon a layer of mortar that serves to raise it about 1 in. above the boards. After this has been done, a second course of bricks on edge is laid, thus enclosing the strip of steel. Two similar courses of brickwork are then laid above the others, but without the addition of the steel bar. Several double courses, the bricks laid flat, with steel bars between the lower courses, are then built, and, after them, another series of four courses of bricks on edge as before. The process is continued until the required space is entirely covered. It should be observed that the steel bars are supported on the flanges of the main girders at each end, and that the courses of bricks on edge form stiffening ribs for the floor, the spacing of the ribs being varied according to circumstances. The lower flanges of the main girders are protected by cement mortar plastered into the gap left by the rebated bricks. In the case of short spans, all the courses may be laid flat in the ordinary manner. Another mode of building floors upon the Kleine system is to employ hollow bricks, made similarly to the Hempstead bricks which were recently described in our columns, the advantage thereby secured being reduction of weight and labour. If made of sufficient depth, a single layer of the hollow bricks will suffice for the entire thickness of the floor, thus saving further time in construction. The under surface of the floor can be plastered in the usual way, and the upper surface may be finished with concrete and cement or covered with any suitable material, such as wood-block flooring, terazzo, or floor boards.

It will readily be understood that examination of constructional details during the progress of work and inquiry into the questions of mechanical strength and physical properties are functions that cannot be performed simultaneously. For this reason, we are unable at the present moment to express any definite opinion as to the strength, fire-resisting and sound-resisting qualities of the new floor system. We are satisfied, however, that the employment of steel in the manner described will afford considerable resistance to tensile stress in the area below the neutral axis of the construction, and, assuming all details to be properly settled with due regard to the weight to be carried, there is every reason for believing that the claims of the patentee may be fully justified by practical tests. So far as concerns resistance to fire, there is no doubt whatever that any floor built of brick is sure to give satisfactory results. We are informed that a fire test of this floor system under heavy loading will be made in the course of a few weeks, and we may, therefore, have occasion to make some further reference to the subject. In conclusion, it should be stated that the inventor claims that his floor can be built so cheaply as to compare favourably in cost with ordinary timber floors, such as are almost invariably found in dwelling-houses. If this claim can be substantiated, there will certainly be a great future for the system we have here discussed.

Joint Isolation Hospital, Normanton and District.—Contracts were let on Friday last week by the Hospital Committee for the Normanton and District Joint Isolation Hospital to be built at Featherstone for 13,977*l.* The hospital is intended to serve the districts of Normanton, Castleford, Featherstone, Whitwood, and Altofts, and comprises administration block, laundry, two fever pavilions, one enteric pavilion, an isolation pavilion, porter's lodge, and discharge block, and is for forty beds. Mr. W. Hamilton Fearnley, of Featherstone, is the architect for the work.

EXHIBITION OF HANDICRAFTS AT HASLEMERE.

THERE was an interesting exhibition at Haslemere last week, when the six handicraft industries which have in recent years been formed there, held their first annual exhibition. The exhibition was interesting from an architect's point of view, for the furniture and woodwork which was shown, as well as for the church hangings, pottery, and tiles. Many architects experience the difficulty of getting church embroidery or hangings with any semblance of living art about them, or coloured textiles of any sort that will both stand wear and remain permanent in colour. The shop-sold article, both in furniture and weaving, is made by machines human or mechanical, with a result that it is almost the universal belief that good and permanent furnishings for our houses cannot now be obtained. The reason, of course, is that no machinery can ever supplant the handicratts; and until that lesson is learnt people will go on spending their money on things that are cheap to buy and fashionable at the time bought, but which are in reality dear at any price, because they are both of a fashion and of a workmanship that passes away. We do not wish to support those who would show us the barest bones of construction and hold them up as a type of beauty. Simplicity has its place in art, the humblest object can show much ingenuity of construction or be decorated with the richest forms of decoration so long as it retains those qualities of beauty, fitness or service that justify its existence; and it is surely one of the pleasantest duties of an architect to discover individual craftsmen who know what they are about. Architects know a great deal about all the trades, but they cannot know everything. In furniture, for instance, a knowledge of the nature of different woods is essential to right design, and in weaving and embroidery there are the same kind of technical questions, which no design on drawing-paper can take into account. The inference then is that, though the architect should conceive the furnishing and decoration of the room that he has planned, intimate co-operation is necessary to bring it to a successful issue. The exhibition at Haslemere was in this respect most interesting and instructive, and if kept up as it has been begun, may do a great deal towards forwarding the interest of handicrafts.

A PROPOSED BRUGES RESTORATION.

OF the old city gates of Bruges still extant, the greatest interest has of late been centred on the Porte d'Ostende, perhaps the least ornate. Many of the Bruges restorations have been based so far on the celebrated plan by Marc Gheeraert, dated 1562, which Mr. Wrale discovered in North Germany some years ago.

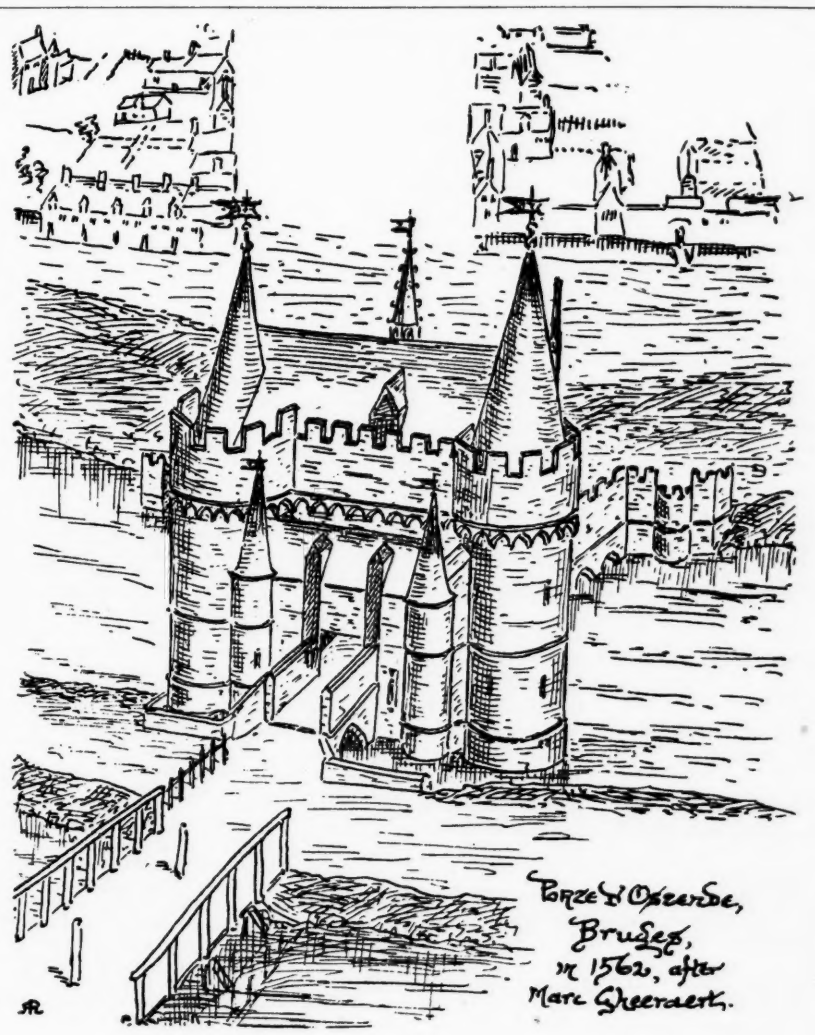
Why the Porte d'Ostende rather than any of the others—Maréchale, Ste. Croix, and de Gand—has been chosen might puzzle archæologists, for more scope for effect lies in the other interesting gates of the city; but the proposed restoration is owing to the great docks recently made between there and the "Bassin," and the altering of the course of the Canal d'Ostende, and the building of a new "Quartier." Round the base of the old gate, however, so as to still have it surrounded by water, for effect's sake, a "foot-bath" has been formed, with quaint result ("Bain-de-pieds" is the local nickname for the new arrangement).

There are many residents for and against the restoration, and there have been lengthy discussions of a lively nature on the matter, in and outside the Conseil Communal, and much ink and paper has been used between the members of the ruling bodies (Conseil Communal, Conseil Provincial, and the State), all of whom go shares in public matters where financial considerations come in.

By the sketch herewith, from Gheeraert's plan of Bruges, an idea of what the old gate was like in the middle of the XVIth century may be obtained. What the other side of the gate was like must be left, unfortunately, to the imagination, but the whole effect was undeniably picturesque.

No doubt the foundations of the demolished gates could be found *in situ*, if looked for.

J. A. R.

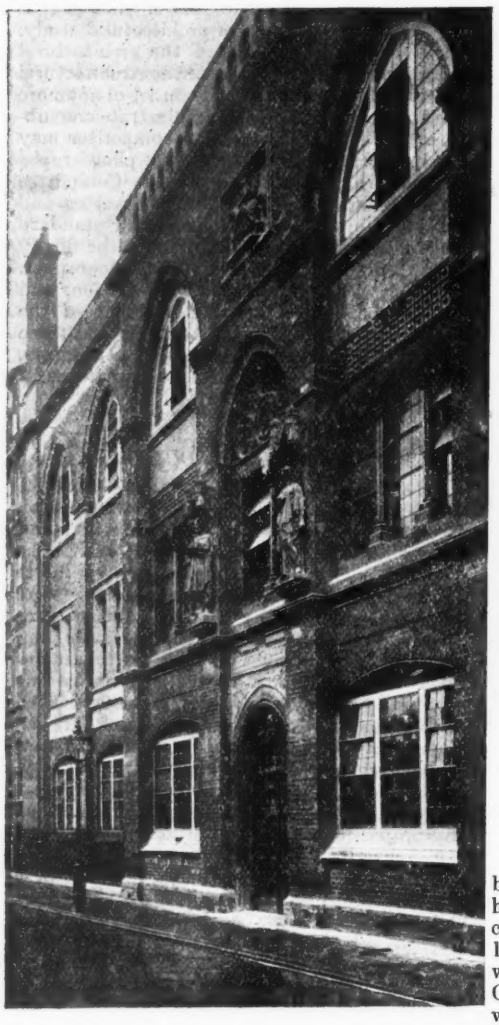


ARCHITECTURAL SOCIETIES.

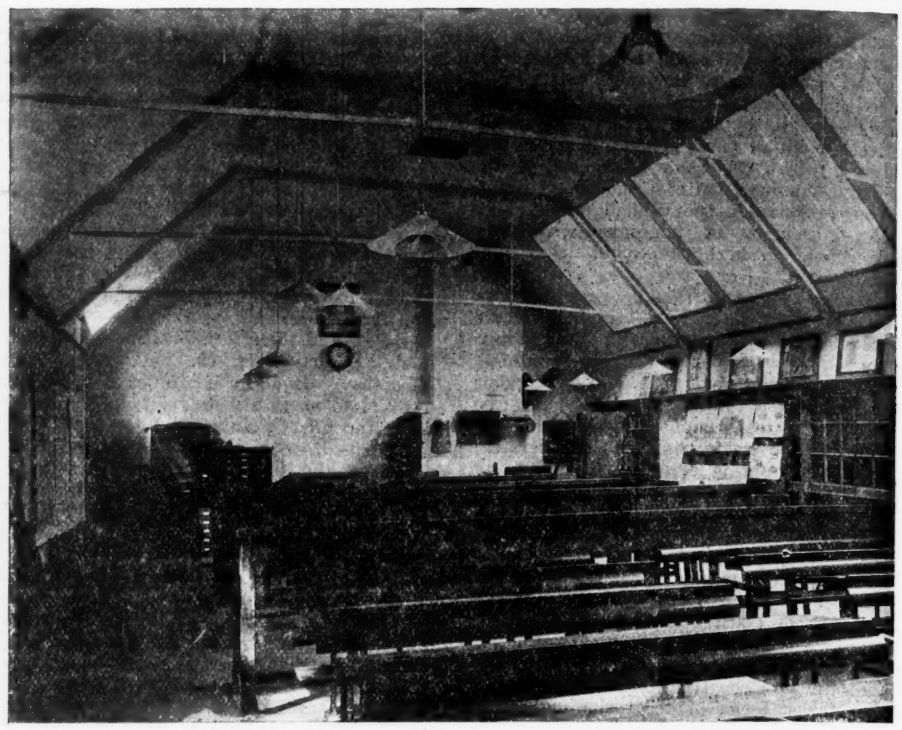
ARCHITECTURAL ASSOCIATION.—We are asked to remind those of our readers who are interested in architectural photography that the photographic competition organised by the Architectural Association Camera and Cycling Club closes on October 1, on or before which date all photographs for the competition must be sent in to Mr. Gilbert H. Lovegrove, the Hon. Secretary of the above-named Club. The competition is confined to sets of photographs adapted for the purpose of architectural study, and is open to members of the architectural profession, and all members of the Architectural Association. Each set should consist of not more than twelve prints, and should illustrate one subject or class of subjects; but a competitor may submit any number of sets. The photographs will have to be approved by the Committee of the Architectural Association Camera and Cycling Club as having reached a fair standard of technical excellence, and will then be finally adjudged by a gentleman, not a photographer, who is an expert in architectural tuition, and who will be chosen by the President of the Architectural Association. A prize value three guineas will be awarded to the best set of prints, and will take the form of books or apparatus.

ARCHÆOLOGICAL SOCIETIES.

BUCKS ARCHÆOLOGICAL SOCIETY.—For the annual excursion of this Society, which took place on August 23, a part of the northern end of the Vale of Aylesbury was selected; and in the course of a long day's touring, many objects of ecclesiastical and domestic interest were seen. It is noteworthy that an unusual consistency was found in the general scale and extent of the churches and in the character of the other buildings visited. After leaving the county town, the party of forty halted at Quarrendon to inspect the ruins of the Chapel of St. Peter, formerly a chapel of ease to the parish church of Aylesbury. Enough remains to tell a sad tale of wilful neglect of a fine mediæval monument; this beautifully-proportioned fabric no longer cries out for authoritative protection, for it is past reclaiming. Various illustrations were produced to prove that in the earlier half of the XIXth century roofs covered the complete structure, but the subsequent destructive agencies of man, be it deplored, and of nature have demolished the larger part of the chapel. There still exists, however, a part of the XIIIth century north arcade and some XVth century insertions in the outer north walls to demonstrate how perfect a specimen of the building arts of the Middle Ages is lost. At Hardwick the church of St. Mary was found to contain much of an attractive nature to archæologists. The nave arcades suggest a rebuilding of the church in early times, for the arches, caps, and shafts do not in any way harmonise, and the moulded shafts appear to be latest in date of the three features. The decorated south door, the XVIIth century mural monument to Sir Thomas Lee, the active honesty of the tower arch, and the Jacobean communion table were all points claiming special attention. The XIXth century operations here, as indeed in most of the Bucks churches, leave much to be desired, and in all future true restorations the work of that period should invariably be the first to be removed. The church of St. John at Whitchurch proved to be somewhat larger than other examples in the district, and is principally Early English in character. A double piscina and triple sedilia in the chancel are of special interest, but the general effect of the interior is much marred by the unpleasant colour applied to the walls. Two exquisite specimens of Jacobean woodwork are to be seen in the oak baluster-almsbox and in the sliding font cover, the latter an adroit arrangement of chains, pulleys, large turned wooden weights, shaped brackets, and turned finials. The mid-day interval with lunch was here entered upon, followed by a business meeting, presided over by Mr. A. L. Liberty, of Great Missenden. An inspection was made of the earthwork marking the site of the castle of Hugh de Bolebec, built about 1145, and which was finally demolished at the close of the Civil War. At Whitchurch several cottages are to be seen of remarkable interest. A late XVIIth century plastered house with brick stables adjoining and the timber-framed schoolhouse with an arcaded end to the ground story are specially fine. At Oving, the church of All Saints was found to be a very compact and satisfactorily-proportioned fabric, and may be said to have excited the general admiration of the visitors. The main lines of the fabric are XIIIth century work; the north arcade is incomplete, with only one bay, which opens into a very short north aisle. The XVth century oak roofs have unusual struts rising from carved oak corbels, but all the parts are in excellent scale. Perhaps the



The Architectural Association Premises, Tufton-street (the Old Architectural Museum Front).



The Architectural Association Premises: Interior of the First Year Room in Day School.

most important church in the neighbourhood is St. Mary's at North Marston, dating principally from the XIVth century. The Perpendicular chancel is said to have been built from the offerings of pilgrims to the shrine of Sir John Schorne, who was Rector from 1290 to 1314; on the north side is a vestry, with watching-chamber above it. The chancel was restored by Queen Victoria in memory of an inhabitant with miserly instincts, who left property to Her Majesty. This work was carried out under the direction of Sir Digby Wyatt, but the value of the interior is destroyed by the crude colouring and design of the reredos and west window. Much of the mediæval work, however, repays careful examination. Granborough Church was the last, and, curiously enough, the least attractive of the very interesting series visited during the day, and it is worth remark that each of the churches possessed a western parapeted tower, amongst other features, similar in design.

THE ARCHITECTURAL ASSOCIATION PREMISES.

WE are indebted to the Secretary of the Architectural Association for the loan of these two engravings, illustrating the exterior and one of the interiors of the new home of the Architectural Association. The exterior is, in fact, the old front of the Architectural Museum in Tufton Street, built in the days of the Gothic revival, and familiar to many in a former generation; but, standing as it does in so out-of-the-way corner of London, it may be worth while to remind our younger readers of the aspect of this monument of the enthusiasm of the Gothic revival. It is likely to be a building better known in the future than it has been in the past, now that it shelters the new life and activity of the large Society which has taken it over.

The other illustration shows the interior of one of the rooms for study.

The interior of the building has been almost entirely remodelled, in a very solid and substantial manner; but there is still much to be done before its final arrangement is reached.

ENGINEERING SOCIETIES.

SOCIETY OF ENGINEERS.—The present year being the jubilee of the Society, the Council have decided that it shall be celebrated by a conversazione. The date is fixed for November 16, at the Royal United Service Institution, where the Society's ordinary meetings are held. On this occasion the museum of the Institution will be thrown open to members and their friends, including ladies. Invitations to the conversazione, with detailed particulars, will be issued in due course.

Illustrations.

WAR MEMORIAL, HAILEYBURY COLLEGE.

THIS is the design by Mr. Reginald Blomfield for a South African war memorial to be erected at Haileybury College, reproduced from the architect's own free and effective pen-drawing which hung in this year's Royal Academy.

Owing to Mr. Blomfield's absence from town we are unable to give his own description of the design, or of the materials of which it is composed. From the appearance of the drawing it is evidently either stone or marble with bronze decorative additions. The general intent and symbolism of the design are too obvious to need comment.

Mr. Blomfield's thorough acquaintance with Renaissance work has enabled him to reproduce its spirit in the free and sculpturesque lines of the base or podium which carries the obelisk, while preserving at the same time a certain originality of treatment.

COUNCIL CHAMBER, DEPTFORD TOWN HALL.

THIS room occupies the centre portion of the north front of the building on the first floor. It is 72 ft. long by 33 ft. wide. The dado and furnishings are in fumigated oak and the upper part in plaster.

The sketch is taken from the Public Gallery.

TECHNICAL INSTITUTE, EASTBOURNE.

THIS building was opened on August 8 by the Duke and Duchess of Devonshire.

An open competition was held in 1899, and won by Mr. Philip A. Robson, the late Professor T. Roger Smith being appointed by the then President of the R.I.B.A. to act as assessor.

To meet the wishes of the Council, the original design was considerably altered and the cost thereby increased. The main floor is devoted to the free library, towards the cost of which Mr. Carnegie has given 10,000*l*. On the first floor is a secondary school and the top floor is devoted to art. The large north windows of the art school governed the design, producing a somewhat novel combination.

The contract now completed by Mr. F. G. Minter is for 34,730*l*. Mr. Hudson was the first clerk of works and Mr. Hanley the second. The finishing to the basement remains to be done, and the fire station, at the back, to be built.

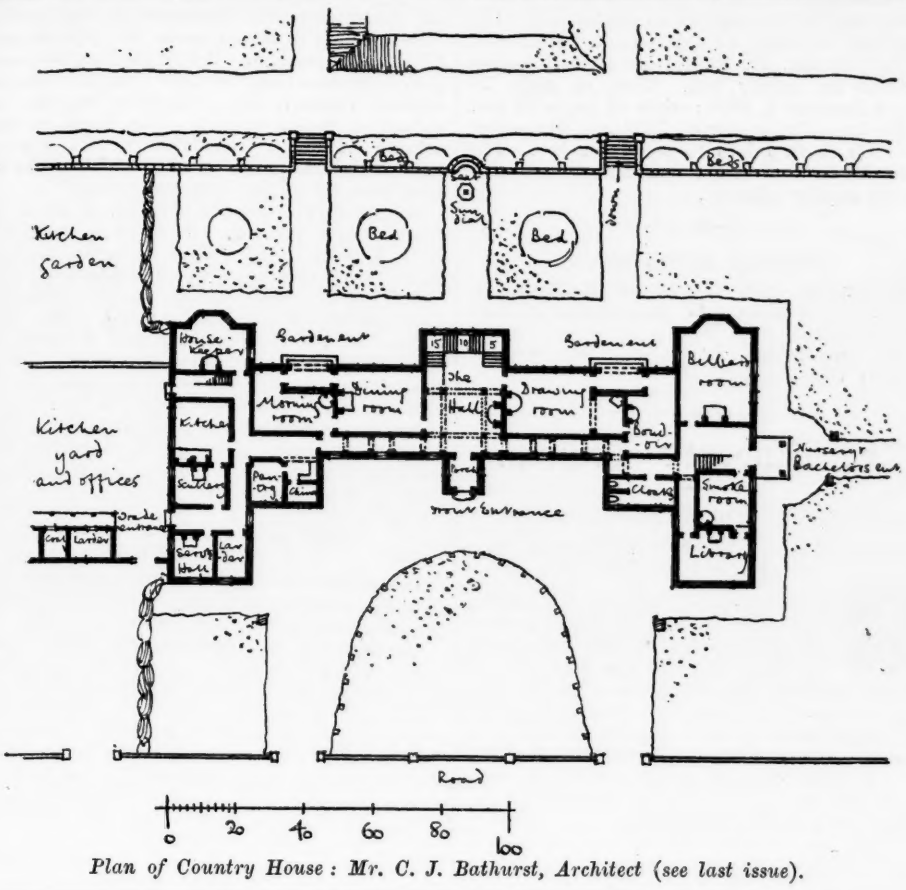
DESIGNS FOR THE DECORATION OF A PUBLIC BUILDING.

THESE are designs made by two students at the Royal College of Art, South Kensington—Mr. W. J. Stamps and Mr. Lancelot Crane.

The students were asked to make a design suitable for a mural decoration for a public building, it being suggested that each should choose a subject connected in some way with the neighbourhood in which he lived or in which he was specially interested.

Mr. Stamps, who lives in an iron-working district, has suitably chosen "The steam hammer." Mr. Lancelot Crane selected the interesting and suggestive subject of the choice of the emblems of the Houses of York and Lancaster; a subject we do not remember to have seen treated in painting before. The conditions of photographic reproduction have reduced the white and red roses of the original to nearly the same tint, so that one point of the illustration has been lost; but the incident does not affect the general design.

SCHOOLS, HOLYSTONE, NORTHUMBERLAND.—The new Council schools at Holystone, near Backworth, are one story in height, and consist of two departments—viz., infants and elder scholars. The mixed department comprises a central hall with separate entrances and hat and cloak rooms for boys and girls on the north side, and two classrooms on both east and west sides of the hall. Each classroom contains accommodation for a class of sixty children, while provision is made, by means of movable partitions, for a class of forty-six in the central hall. The infants' school is built up against the east wall of the main school, and comprises school-room, 32 ft. by 20 ft., classroom for forty-four, marching corridor, 13 ft. wide, and cloakroom and lavatory accommodation. Covered playsheds and the usual offices are provided on the north side of the playground. The schools are heated with hot water pipes. The elevations are executed in red bricks, and the roofs are slated. The whole of the work has been done by Mr. Nichol Ritchie, contractor, of Whitley Bay, from the designs and under the superintendence of Messrs. Oliver, Leeson, and Wood, architects, Newcastle.



Plan of Country House: Mr. C. J. Bathurst, Architect (see last issue).

PLAN OF A COUNTRY HOUSE.

THIS is the plan of the Country House by Mr. C. J. Bathurst, of which two views were given in the plates in our last issue.

The plan, as will be seen, is rather unusual in character; the long corridor is an effective internal feature, but the boudoir and the recess in the drawing-room seem rather insufficiently lighted, and we notice the often-repeated mistake in house-planning of having a right-hand light on the kitchen fireplace, instead of a left-hand one. There is no compass point; presumably the garden front faces south.

It is, however, an interesting attempt at special character in a house plan.

Books.

Hydraulic Power and Hydraulic Machinery. By PROFESSOR HENRY ROBINSON, Professor Emeritus of Civil Engineering, King's College (London), M.I.C.E., M.I.M.E., M.I.E.E., F.S.I., etc. Third edition, revised and enlarged with sixty plates and numerous illustrations. London: Charles Griffin and Co., Ltd. 1904.

SINCE the modern hydraulic power system was developed some fifty years or more ago by the late Lord Armstrong, its use has been extended to many fields of industry, and during recent years water-power has been employed for many purposes other than those mentioned in the first and second editions of Professor Robinson's well-known handbook. Books written by men who are really proficient in the subjects discussed are always possessed of distinctive value, and in the example now before us an additional feature of interest is to be found in the fact that the earliest experiences of the author in hydraulic engineering were obtained when acting as an assistant to Lord (then Sir William) Armstrong. We need scarcely refer to the preliminary discussion of "Discharge Through Orifices," the "Flow of Water Through Pipes," and kindred matters, except for the purpose of remarking that due attention is paid to recent investigations described in the transactions of the Institutions of Civil and Mechanical Engineers and of the American Society of Civil Engineers. These additions refer chiefly to the importance of coating water-mains in an adequate manner, and instances are cited showing the serious diminution of discharging capacity and other undesirable results which follow the accumulation of deposits in pipes and the absorption of tarry compounds by the water conveyed. The results of some experiments by Mr. Weston, described in the transactions of the American Society of Civil Engineers, are also quoted showing the effect produced by the sudden closing of valves against water in pipes. In the first series of experiments, the author tells us that water at an average static pressure of 70 lb. per square inch flowed through lengths of pipes thus:—"111 ft. of 6-in. pipe, 58 ft. of 2-in. pipe, and 99 ft. of 1¼-in. pipe to a 1-in. outlet pipe, with a ¼-in. orifice. In this case the velocity was 0·15 ft. per second in the 6-in. pipe and 5·36 ft. in the 1-in. pipe. Upon closing the orifice (which was effected in 0·16 of a second) the force of the ram in pounds per square inch was 129·2 lb. in the 1-in. pipe, 127 lb. in the 1¼-in. pipe, and 14·5 lb. in the 6-in. pipe." Similar results were obtained in other experiments, some of which showed important reduction of ram force when an air vessel was connected to the pipe system. These tests were a most useful series, and the notes upon them given by the author should be much appreciated by his readers.

After discussing "The Accumulator" and some recent developments of that device, Professor Robinson commences in earnest the detailed consideration of hydraulic machinery as applied in modern engineering practice. We need not traverse the whole of the ground covered by the author, and will confine ourselves to some notes relative to new material introduced in the pages of the present edition of his work. Among hydraulic presses may be mentioned an advantageous type of forging press, in which the application of two cylinders, one near each end, permits the weight and width of the upper framework to be reduced to a minimum. In this press, also, a groove is turned in the mouth of each cylinder to receive the packing leathers, so that the ram, instead of the cylinder, is the surface which works against the packing leather. The advantage of this is that, as the ram is always exposed to view, any scratches can be detected at once, whereas when the packing leather is fixed to the ram any "grooving" that takes place will be on the inside of the cylinder, where it cannot be seen and is always difficult and expensive to rectify. An item of considerable interest is the description of the swing aqueduct by which the Bridgwater Canal passes over the Manchester Ship Canal. Numerous hydraulic lifts of modern construction are noticed in succeeding sections of the book. Among them we may mention the Otis elevator, the Glasgow Harbour elevators, waggon lifts for railway companies, grain conveyors, and the Waygood lift. Professor Robinson also describes the hydraulic lifts used on the City and South London Railway. These are still retained, but we may remark that in recent extensions of the line electric lifts have been installed. Some excellent views are given of hydraulic hoists and cranes for docks and on board ship; and among recent examples of hydraulic power the author cites the machinery at the Tower Bridge and dock-gate machinery at Liverpool and elsewhere. Those interested in the application of hydraulic power to machine tools will find an account of some appliances of the kind, chiefly hydraulic riveters of various types. Among pumping engines we may specially single out the description of a recent installation carried out by Messrs. Easton and Co. for the Tasmania Gold Mining Company in order to permit water to be pumped from the depth of 918 ft. Another interesting section, devoted to the "Worthington Pumping Engine," describes the characteristics of the recently-installed high duty engines at the East London Waterworks, and includes a summary of some results brought before the Institution of Mechanical Engineers in February, 1903. The use of hydraulic power in tunnelling, hydraulic brakes, hydraulic jets for pile sinking, pump dredgers, hydraulic pile drivers and pile screwing apparatus, hydraulic excavators, water meters, water wheels, and turbines are among the remaining branches of the subject discussed in this most excellent work.

The Application of Electric-Motors to Machine-Driving. By ANDREW STEWART, A.M.I.E.E. Special Edition. London: S. Rentell and Co. 1904.

AS OUR readers are aware, the application of electricity to the transmission of power is no new thing, but the system is not so generally adopted as it ought to be. In large works, where power has to be provided at widely separated points, the employment of electricity provides a simple and effective means of avoiding the losses arising from miles of steam pipes connected with various outlying steam engines, or the excessive consumption of fuel resulting from the use of separate steam boilers in different departments. But in small and compact establishments, where all the machinery to be driven is situated within easy reach of the main engine, it is not so clear that advantage will follow the adoption of electrical driving. Our readers are more or less concerned with the design and management of establishments complying in the main with the two cases mentioned above. Architects have frequently to consider the needs of public institutions where power is required in various buildings scattered over a comparatively large area, while builders and contractors have similarly to apply power for the purpose of erecting such buildings, or for the needs of their own works. Again, the attention of both architects and builders is constantly occupied by the requirements of smaller institutions and commercial establishments where all the machinery is situated near to the source of power. The two points generally considered in connexion with electrical driving are (1), initial cost as compared with the mechanical transmission of power, and (2) economy of working. Some useful information on both these points is contained in the handbook to which we now direct attention, and which also gives particulars of the most approved methods of electrical driving, and of the auxiliary appliances for the control of such systems.

Society of Engineers: Transactions for 1903. London: E. and F. N. Spon, Ltd. 1904.

MOST of the matter in this volume has already been reported in the Press, and the more important papers and discussions have been noticed in our columns. Readers have now an opportunity of studying the various contributions at leisure, in conjunction with the tables and diagrams which are bound with the Transactions. The paper by Mr. Butler on "Certain Vexatious and Fallacious Cement Tests now in Vogue" is of importance as demonstrating the absolute fallacy of the temperature test, a point which is emphasised by tables and a plate including two sets of figures reproduced from photographs. Figs. I. to IV. represent pats of cement which evolved considerable heat during setting, and yet passed every known test for soundness; while Figs. V. to VIII. show pats which evolved no heat during setting, and yet were utterly unsound and

worthless. Architects, as well as engineers, will find useful material in the contribution by Mr. Ernest R. Matthews on "Electric Light Stations, their Design and Arrangement," a paper which deals exclusively with structural work and is illustrated by five folding plates containing plans and sections of buildings suitable for such establishments. Other papers worthy of perusal are those upon "Motor Transport for Goods," by Mr. Douglas Mackenzie, and "Mechanical Stokers for Electricity Generating Stations," by Mr. Albert Gay. The volume concludes with a general index for the period 1857 to 1903.

Sea Coast Erosion and Remedial Works. By T. ALLONSON-WINN, M.Inst.C.E.I. London: St. Bride's Press, Ltd. 1904.

PUBLIC interest in the subject of coast protection is by no means on the decrease, although in many parts of the country the ravages of the sea appear to be regarded with comparative indifference. The pamphlet to which we now refer is reproduced from four consecutive articles which appeared in the pages of our contemporary *Public Works*, and the author, who has devoted much time to the study of marine engineering, propounds a theory which presents a new aspect of the foreshore protection problem, and is worthy of careful consideration. Interest is added to the pamphlet by a series of short notes upon some two dozen coast lines, on most of which the author has been professionally engaged.

Oxted, Limpsfield, and Edenbridge, with their Surroundings. By GORDON HOME. London: The Homeland Association, Ltd. 1904.

AS INDICATED by the title, this addition to the Homeland Handbooks deals with that delightful tract of country so essentially "English" in all its features at the junction of the three counties of Surrey, Kent, and Sussex. Crowhurst Place and church and the fine castle at Hever (now closed, unfortunately, to the public) are included. Lingfield, with its interesting church and village, although but a short distance south of Crowhurst, is omitted; no visitor to this district should, however, miss seeing it. The guide is excellently illustrated with reproductions from photographs and drawings by the author.

Holy Trinity Church, Rothwell, Northants. By H. CAYLEY, M.A., A.R.I.B.A. Kettering: W. E. and J. Goss.

ROTHWELL is perhaps best known for its market house—now repaired and in use; but this pamphlet serves to draw attention also to the very interesting church, and gives a good account of its various architectural features in order of date. The illustrations consist of two full-page photographs and a ground plan. The latter, which has been apparently very carefully measured, would have been of still greater value had it not been reduced quite so much in reproduction. The various dates of the church, so far as they show on the plan, should also have been marked on it; it would have been easier to follow in the letterpress the numerous changes and alterations which this interesting building has undergone.

Single Entry Book-Keeping for Builders. Edited by PAUL N. HASLUCK. London: Cassell and Co., Ltd.

THIS useful little manual is a reprint of a series of articles originally appearing in the *Building World*, and is simple, fairly comprehensive—and cheap. The novice who contemplates opening a set of books, will perhaps be dismayed at the number declared to be necessary. The list is certainly a long one, but, as the business of a builder and contractor is practically a combination of several industries, this is unavoidable. At the close of the book, a chapter (No. IX.) is devoted to a simplified system for small builders; and another to book-keeping for Builders' Foremen, in both of which some very useful hints are given.

The title suggested for one of the books mentioned in Chapter IX. (Invoice Book) clashes with Chapter VI. In the former case the book thus entitled is described as a summary of all bills or accounts *sent out*, whereas the Invoice Book of Chapter VI. is a record of goods *purchased*. The alternative title for the last-named, shown at page 8 (Bought Book), appears preferable, and would obviate confusion.

The compiler anticipates "a future" for this work, and in the copious examples given the year 1909 is employed throughout. Here and there, however, are indications that this date replaces an earlier one. Thus at page 75 occurs January 1, 189–; while at pages 82 and 84 the dates, September 16, 1898, and September 19, 1909, both relate to the same job. The examples themselves are clear and concise, and can be readily followed.

BOOKS RECEIVED.

RESISTENZA DEI MATERIALI E STABILITÀ DELLE COSTRUZIONE. G. Sandrinelli (Milan: Ulrico Hoepli).

LE ABITAZIONI POPOLARI. E. Magrini (Milan: Ulrico Hoepli).

The Student's Column.

NOTES ON PORTLAND CEMENT.

CHAPTER VII.—WEIGHT PER BUSHEL AND SPECIFIC GRAVITY.

THE weight-per-bushel test is a relic of the early days of Portland cement when it was sold by the bushel, and is of no value to the user, as it is chiefly governed by the fineness of grinding and the age of the sample. A cement a year old weighs about 15 per cent. less than when it is new. All that can be said for the test is that it is a rough way for the manufacturer, who knows what his cement of a certain fineness should weigh, to keep a check on his burning.

There are several apparatus for determining the weight per bushel, the object of which all are that the cement shall fall into the measure in a steady, uniform stream from a given height. It is evident that if the cement is shovelled in it will weigh more than when lightly filled.

The best-known apparatus is that designed by the late Sir John Coode. It consists of a hopper carried on a frame, into the apex of which is fitted an elongated cone. The cone is supported by four horizontal pins fixed to the sides of the hopper. The space between the cone and the outlet of the hopper is $\frac{1}{2}$ in. wide, so the cement, which is fed into the hopper, passes therefrom in a steady stream. The top of the bushel measure is 18 in. from the outlet of the hopper, and the cone projects 9 in. below this outlet. When the bushel measure is full, the cement is struck off level with a straight-edge. Of course, it is evident that no jarring of the measure is permissible till after it is filled and struck off level.

The weight per bushel is now being abandoned for the specific gravity test, which is much more reliable and not affected by the fineness of grinding. The age of the sample, however, affects the results, a cement after six months' aëration showing a decrease of from 4·5 to 8 per cent. of its original specific gravity. This is due to the cement taking up moisture and carbonic acid from the air.

Cement being acted on by water it is impossible to estimate the specific gravity in the ordinary way by weighing in water. It is therefore necessary to use a liquid having no action on cement. The most generally used are turpentine and petroleum.

The method used by some operators is to estimate the weight of liquid displaced by a known weight of the cement and calculate the specific gravity of the latter therefrom, an ordinary specific gravity bottle having a perforated stopper and a liquid of known specific gravity being used. The specific gravity is calculated thus:—

$$\text{S.G.} = \frac{\text{Weight of cement} \times \text{S.G. of liquid.}}{\text{Weight of liquid displaced.}}$$

One of the oldest apparatus is that devised by Mann (Fig. 1), whose description is as follows:—

"It consists of a small glass vessel, holding, when filled to the mark A on the neck, a given quantity of liquid, and of a glass pipette furnished with a graduated stem and stopcock, and containing, when filled to the mark B on its upper extremity, a volume of liquid equal to that held by the first-mentioned vessel *minus* the quantity displaced by 1,000 grains of the densest substance intended to be examined. In using the gravimeter, the pipette is filled to the mark B with paraffin, turpentine, spirit of wine, or any other liquid which does not act on the cement (preferably paraffin); 1,000 grains of the cement are then introduced to the smaller vessel, which is placed under the pipette and filled to the mark A. Before this is quite completed the vessel may be corked and the contents shaken to remove any air bubbles that may be entangled in the cement. The height of the column of liquid remaining in the pipette determines the specific gravity, which can be at once read off on the graduated stem."

Schumann's apparatus (Fig. 2), which is in use on the Continent, consists of a graduated tube A ground into a small flask, the graduations being from zero to 40 ccs. divided into tenths of a cubic centimeter. To estimate the specific gravity of cement with this apparatus, the tube is fixed into the neck of the flask and paraffin introduced until flask and tube are filled to the zero mark; 100 grammes of cement are then introduced down the tube and the reading taken. This gives the volume of liquid displaced by the 100 grammes of cement from which the specific gravity is calculated thus:—

$$\text{S. G.} = \frac{100}{\text{Volume displaced.}}$$

The temperature should be the same at each reading, and for this purpose the apparatus is placed in water of constant temperature.

Candlot devised a modification of this apparatus (Fig. 3). It is the same in every respect, only the top of the tube terminates in a bulb. The *modus operandi* is as follows:—A quantity of paraffin is put in the bulb so that when the flask is attached and the apparatus reversed the flask is filled as far as one of the first graduations. The apparatus is again reversed, so that the liquid flows back into the bulb, and 100 grammes of cement are put in the flask. The apparatus is again reversed, the liquid flows back into the flask, and the displacement caused by the cement is read on the graduated tube.

Fig. 4 shows an apparatus designed by Le Chatelier and recommended by the French Commission des Méthodes d'Essai des Matériaux de Construction. It consists of a flask of about 120 ccs. capacity. About half-way up the neck is a bulb of exactly 20 ccs. capacity indicated by marks above and below it. Commencing at the mark above the bulb the neck is graduated from zero to 3 ccs. in tenths of a cubic centimeter. The method of using the apparatus is as follows:—The flask is filled with the necessary liquid to the mark below the bulb; 64 grammes of cement are weighed and introduced to the flask down a funnel until the liquid rises to the zero mark on the neck. The flask is then immersed in water of the same temperature as the liquid, and more cement added, if necessary, to bring the liquid up to the zero mark. The remainder of the cement is then weighed, and the quantity that has been introduced to the flask corresponds with the weight of cement equivalent to 20 ccs. of water. This weight divided by 20 gives the specific gravity.

Keat's specific gravity flask consists of two bulbs, one above the other (Fig. 6), the neck of each being marked. The bottom bulb is of any capacity, but the capacity of the upper one between the two marks is that of 1,000 grains of water at normal temperature. To do an estimation with this apparatus, the lower bulb is filled with the necessary liquid to the mark on the stem, and the weight taken. The cement is then introduced till the liquid rises to the upper mark. The flask is immersed in water of the same temperature as the liquid, and, after allowing time to cool, more cement added, if necessary, to bring the liquid to the upper mark. The weight is again taken. The difference between the first and second weighings gives the weight of a bulk of cement equivalent to 1,000 grains of water, and the specific gravity is this increase, divided by 1,000.

In apparatus like that of Schumann's, the difficulty in getting the cement down the long narrow stem, and in that of Keat's and Le Chatelier's, the cooling of the liquid and adding small quantities of cement to bring the liquid to the required mark, introduce sources of error.

To obviate this a flask was devised by Messrs. Stanger and Blount (Fig. 5). It is practically the same as Le Chatelier's, only the stem is straight and graduated in tenths of a cubic centimeter from the bottom to the top. To the bottom mark the volume is 64 ccs., and to the top mark 67 ccs.; 50 ccs. of liquid are measured into the flask by means of a pipette, then 50 grammes of cement gradually added. After bringing to a constant temperature, the

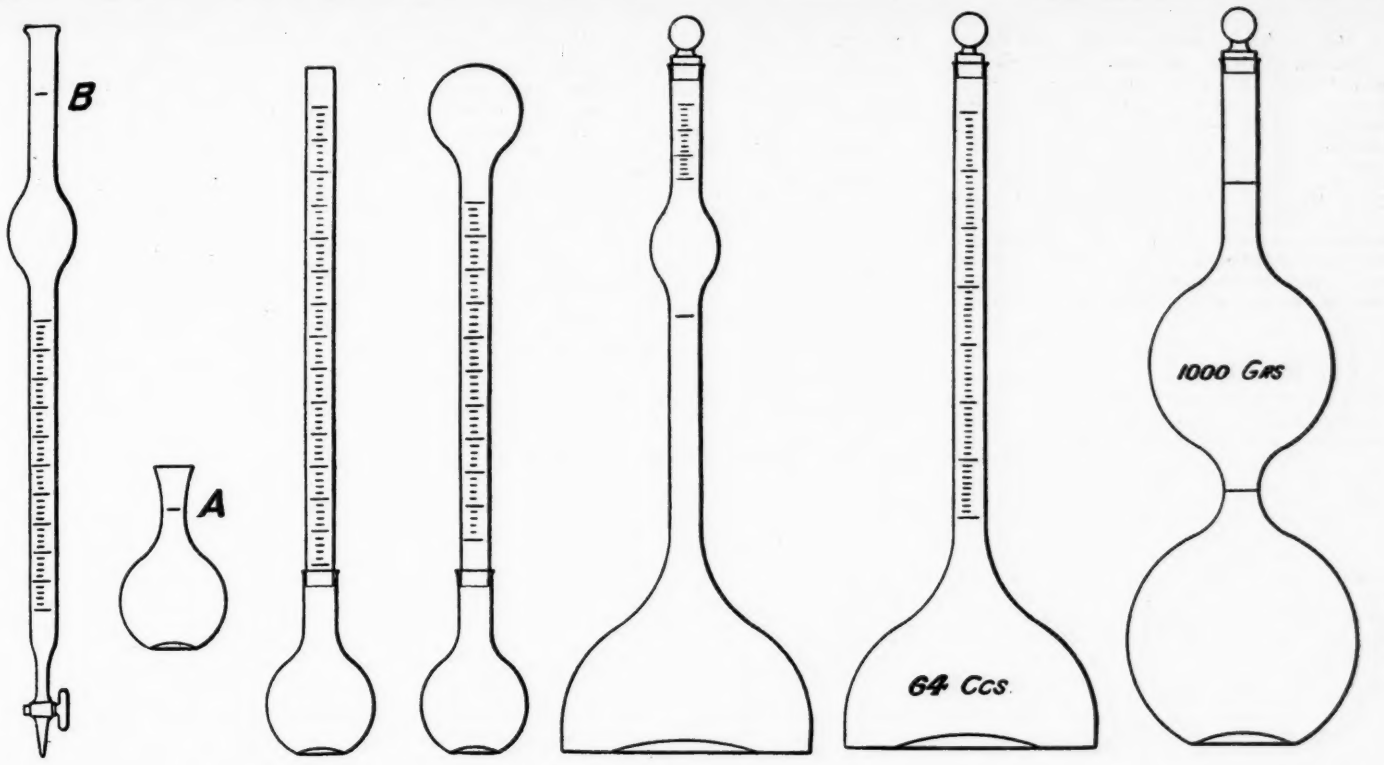


FIG. 1 FIG. 2 FIG. 3 FIG. 4 FIG. 5 FIG. 6

reading on the stem is taken and the specific gravity calculated thus:—

$$\text{S.G.} = \frac{50}{\text{Reading in ccs.} - 50.}$$

At first sight, it appears a very simple operation to estimate the specific gravity of cement, but it is a scientific test, and a very small error in the manipulation will give a result far from correct. If a chemical action is set up between the cement and the liquid employed, a wrong result will be obtained.

Of the liquids generally used, turpentine which has been thoroughly dehydrated is the best, but even this liquid after standing for a time in contact with cement evolves a gas, which can be shaken out by gently tapping the flask. Cement has a still stronger action on petroleum, and with it the cement clogs and encloses air, which is difficult to get rid of.

The author knows of one engineer who uses Keat's apparatus and petroleum as the liquid. After the cement is introduced to the flask, it is allowed to stand for hours, sometimes overnight, before the second weighing. By this time the liquid has swelled through the evolution of gas which is held in the cement. This engineer can seldom get a specific gravity greater than 3, and more often under 3.

Xylol is a liquid which has recently come under the author's notice, and gives good results. The cement drops through it without entangling any air, and there is absolutely no action between it and the cement, even after standing overnight. Xylol is very volatile and requires careful handling.

Mann, in describing his apparatus, gives spirit of wine as one of the liquids which can be used, but this is worthless in testing cement for specific gravity, as it contains about 15 per cent. of water. Whatever liquid is used, it should be absolutely free from water. If necessary dehydration by distillation or some chemical absorbent of water must be resorted to.

A point which should be taken into account in determining the specific gravity of cement is the amount of aëration to which it has been subjected. Some operators dry the samples in an air-oven before weighing, to drive off the moisture, but the greater part of the moisture taken up by cement combines chemically with it, and can only be driven off at a red heat, and the carbonic acid which is absorbed can only be expelled at a still higher temperature.

All graduated apparatus should be calibrated before use, to make certain the markings are correct. A very small error in the volume held, such as a drop or two, will give a considerable error in the specific gravity. For a number of years the author used a 50-cc. pipette which held 2 to 3 drops in excess, and allowance had to be made for this.

Another point worth noting is that apparatus which is constantly used for measuring off turpentine should not be left for any considerable time without cleaning, as the turpentine deposits a skin of resin on the glass and so reduces the volume of the measure.

OBITUARY.

MR. ELLISON.—We regret to announce the death, on August 17, at his residence, No. 22, Mannering-road, Liverpool, of Mr. Christopher O. Ellison, aged seventy-one years. Mr. Ellison was the senior partner of the firm of Messrs. C. O. Ellison and Son, of Liverpool, architects and surveyors. Mr. Ellison had an extensive practice in the northern counties, and the firm were among the eighteen who were invited by the London County Council to submit competitive designs for the erection of working-class dwellings upon a part of the site at Millbank, as cleared by the demolition of the convict prison; in February, 1894, they gained the first premium for the North Wales Counties Asylum, at Denbigh; in our columns of November 27, 1897, we described and commented upon their invention, "the O.B. closet," for minimising the noise of the flush. Messrs. C. O. Ellison and Son were architects of the new Infirmary in Smithdown-road for the Toxteth Guardians, Liverpool (1893-4), and of the extensive additions thereto made five years subsequently: of Bevington House, for the People's Homes Co., at Bevington Bush, Liverpool, begun in June, 1898, and opened for 450 lodgers on January 11, 1900, with provision in the plans for 650 beds when completed, and established after the plan of the "Rowton Houses" in London; and of the Bradstock Lockett Home at Stockport for Crippled Children (1901-2). They prepared the plans and designs for the Town Hall in Hamilton-road, Birkenhead; the Eye, Ear, and Throat Hospital for Shropshire and Wales in Murivance, Shrewsbury (1881); hospitals at Belper and Bootle; and, in Liverpool, of the Eye and Ear Hospital, in St. Paul's-square; the artisans' dwellings (1890) for the Corporation; the Adelphi Hotel, in Ranelagh-place, W.; the Adelphi Bank; and the Eye and Ear Infirmary, in Myrtle-street. They were the architects of several Board schools in Lancashire, and of churches in some of the large towns of Yorkshire, W.R., in Rugby, Newcastle-on-Tyne, and elsewhere, and of the promenade at Douglas, in the Isle of Man. We may add that Mr. Ellison, an enthusiastic volunteer, was mainly instrumental in the founding and establishment of the 1st Lancashire Engineer Volunteer Corps, Liverpool; on his retirement from the command of the regiment, in 1875, he was appointed its honorary colonel, and eleven years ago he was presented with the "V.D." in recognition of his long service in the auxiliary forces of the Crown.

MR. LANSDOWNE.—We have also to announce the death of Mr. E. A. Lansdowne, member of the firm of Messrs. Lansdowne and Griggs, of Metropolitan Bank-chambers, Newport, Monmouthshire. In conjunction with the late Mr. Thomas M. Lockwood, of Chester, Mr. Lansdowne prepared the plans and designs for the town hall and municipal offices, Newport, of which we published three illustrations, with plans, on August 29, 1885—in the competition he and Mr. Lockwood won the first and second premiums, respectively, and they were ultimately appointed to be joint architects of the building; Mr. Lansdowne was also employed as architect (1893-4) for the alterations, with improvements, of the Duffryn, at St. Nicholas, near Cardiff, for Mr. John Cory, J.P., etc. Of the principal architectural works carried out by him and his partner, Mr. H. J. Griggs, we may instance the following:—The institute and mission hall at St. Nicholas, Cardiff; extension of the British Schools in Park-street, for the Blaenavon School Board; additions, etc., to the workhouse buildings at Panteg, and at Griffithstown, for the Pontypool Union Guardians; the cottage hospital, for accident cases, with operation theatre, convalescents' day-room, and three wards, near Hillside House, Ebbw Vale, Mon.; hotels at Tredegar Junction and Caerphilly (the King's Arms), for Griffiths Brothers, Ltd.; the schools near Crumlin and (for 400 children) at Lower Garndiffaith, Pontypool, for the Trevethin School Board; the School at Pontnewynydd; and the parish hall in Risca-road, Newport. Amongst their most recent works are comprised the enlargement, etc., of the Williams Endowed Schools at Caerleon; the Infants' School at Garndiffaith; the rebuilding of the Three Salmons Inn, at Bassalley, for Lloyd and Yorath, Ltd.; an extension of the Gwehelog School, near Usk; the rebuilding of the Greyhound Hotel, at Christchurch, near Newport; the church institute and school for St. John the Baptist Church, Newport; and the Tredegar Arms Hotel, at Pill, Newport.

MR. JOSEPH MASTIN.—After a painful illness, the death took place on Saturday last, at his residence, 256, Fulwood-road, Sheffield, of Mr. Joseph Mastin, head of the Sheffield firm of builders and contractors, 15, Cavendish-street. The deceased, who was sixty-six years of age, was a native of Shropshire, and came to Sheffield about forty-five years ago, starting business on his own account ten years later. For the last twenty-two years his place of business was in Cavendish-street, and during that time he has erected many large buildings in the city.

STAINED GLASS AND DECORATION.

REDECORATION OF THE ASSEMBLY ROOMS, BATH.—The redecoration of the Bath Assembly Rooms is now being undertaken. The rooms, which were originally erected from the designs of the younger Wood, are being restored under the supervision of Mr. Stanley D. Adshead, architect.

GENERAL BUILDING NEWS.

CHURCH TOWER, ARMLEY, LEEDS.—Twenty-seven years after the consecration of the church, the tower of St. Bartholomew's, Armley, Leeds, has just been completed. The church itself, by the side of which stands the original building erected in 1630, was built at a cost of 25,000*l.*, and was consecrated in 1877. The base of the tower was at that time carried 75 ft. above the ridge of the roof, being a total elevation of 153 ft., and was left incomplete through lack of funds. The new tower has been erected from the designs of Messrs. Walker and Athron, the architects of the church, Mr. J. T. Wright being the contractor for the masonry. Altogether, the tower with spire is a little short of 200 ft., and on the apex is a gilt knob surmounted with a gilded iron cross 9 ft. high.

WESLEYAN METHODIST CHURCH AND SUNDAY SCHOOL, HEBDEN BRIDGE, YORKSHIRE.—The foundation-stones of the new Wesleyan Methodist church and Sunday school at Hebden Bridge, have been laid. The buildings are estimated to cost 4,500*l.* The ground floor provides for a large schoolroom, a young men's room, infants' room, and nine classrooms, with heating accommodation; while the chapel above will seat 500 people. The premises will be lighted by electricity. Mr. W. H. Cockcroft, of Hebden Bridge, is the architect. The work is being carried out by the following contractors:—Masonry work, Messrs. H. Mortimer and Sons, Hebden Bridge; carpentry and joinery, Mr. Robertshaw Greenwood, Hebden Bridge; slatering and plastering, Messrs. Wrigley and Son, Hebden Bridge; plumber's and glazier's and heating work, Messrs. Boulton and Kershaw, Mytholmroyd; concretor's work, Messrs. Greenwood and Son, Halifax.

NEW PRIMITIVE METHODIST CHURCH AND SCHOOLS, WALSALL.—The foundation-stones were laid recently of the new Primitive Methodist church and schools which are being built in Stafford-street, Walsall. The buildings are being erected from the plans of Messrs. John Wills and Sons, of Derby and London, and will accommodate a congregation of 650 persons. The general design is late English Gothic. There will be a tower and spire. The front of the building is being faced with best red Accrington bricks, and the dressings are being executed in terra-cotta. The glazing is in cathedral leaded lights. The cost of the buildings, which will also include a school with assembly room and five classrooms, will be 4,550*l.* The builders are Messrs. Henry Gough and Son, of Wolverhampton.

NEW SCHOOL, TULLIBODY, N.B.—On the 20th ult. a new school was opened in the parish of Alloa, at Tullibody. The building is built to accommodate 320 pupils. The total cost being 4,100*l.* Messrs. Thomas Frame and Son, architects, Alloa, prepared the plans for the work.

PARISH HALL, SUNDERLAND.—The foundation-stone of the new Sunday school and parish hall, which is to be erected in Fulwell-road, Sunderland, in connexion with All Saints' Church, was laid on the 20th ult. The plans for the new building have been prepared by Messrs. W. and T. R. Milburn, and the work is being carried out by Mr. J. R. Birney. The cost is 1,500*l.*

PUBLIC LIBRARY, KEIGHLEY.—The opening of the Carnegie Public Library, at Keighley, took place on the 20th ult. The new building occupies a site in North-street. It has been erected with slight modification from the plans submitted by Messrs. A. McKewan and James A. Larn, of Birmingham, and placed first by Mr. Leonard Stokes, the assessor, out of the 146 competitive designs sent in. Sufficient land is provided on the south side for extensions, and the important rooms—viz., the lending library and news-room, and reference library, have therefore been placed on that side. The premises are designed in a free treatment of Early Renaissance. The ground floor contains the lending library and news-room. The library has accommodation for 40,000 volumes, and the news-room will seat about 150 readers. Access to both is obtained from the entrance hall. The reference library, with accommodation for 100 readers; the patent library, and the book-room are on the first floor. All the walls are plastered, and the principal rooms have tile dadoes. The floors are of solid wood blocks, with mosaic work for the halls and passages. Red deal, stained green, has been used for the woodwork, but the furniture throughout is of fumed oak, dull polished. The rooms are lighted by electricity, with a separate system of gas-lighting in case of emergency. Local stone has been used for the outside structure, and the roofs are covered with green Filberthwaite slates. The stone carving was executed by Mr. Alex Smith (Keighley). The work has been carried out under the superintendence of Mr. Robert Midgley, one of the Corporation building inspectors, as clerk of works. It is anticipated that the total cost will not exceed the sum of 10,000*l.* given by Mr. Carnegie.

BUSINESS PREMISES, HALIFAX.—New business premises have been erected in Commercial-street, Halifax, for Messrs. Alexander Scott, Ltd. The principal contracts have been carried out as follows:—Masonry, Messrs. Crawshaw and Sons, Rippenden; joiners' work, Messrs. Moore and Sons, Claremount; plumbing and glazing, Mr. T. Boocock, Halifax; electric light, Messrs. H. Nunns and Co., South Parade; fibrous plaster ceiling and painting, Messrs. Jonas Binns and Son; iron and steel work, Messrs. Wood and Co., Manchester; plastering, Mr. Bancroft, Halifax. The architect was Mr. W. Clement Williams.

NEW PREMISES, BANBURY.—New business premises are to be erected at the corner of the town hall buildings, at Banbury. The work is to be carried out from the plans of Mr. W. E. Mills, architect.

NEW OFFICES OF THE GLASGOW CLEANSING DEPARTMENT.—The Glasgow Cleansing Department have moved into new premises in Cochrane-street. The premises have been remodelled under the supervision of Mr. M'Donald, the City Engineer.

ALTERATIONS TO THE TOWN HALL, LEEDS.—The reconstruction of the orchestra and ante-rooms at the Leeds Town Hall is now being carried out. The old structure has been removed, with the exception of the platform, and it is being replaced by a larger orchestra, which is of classic design. The seating accommodation has been arranged for a chorus of 364, and a band of 221. Previously there were only permanent seats for 300. The existing doors on each side of the orchestra will open into a square vestibule, and folding-doors will be fixed between the ante-room and the hall. Two retiring-rooms for principals have been provided under the platform, and also a band-room, the latter being on a level with the crypt. Additional facilities have been planned for reaching and leaving the orchestra. Mr. J. B. Fraser, architect, Leeds, planned the alterations, and the cost is estimated at 1,200*l.*

NEW HOSPITAL, NEWCASTLE.—At the annual meeting of the Newcastle Throat and Ear Hospital, held on the 17th ult., it was proposed that a new hospital should be erected at a cost of 4,500*l.* Mr. Parsons, architect, of Newcastle, has prepared the plans for the proposed work.

ISOLATION HOSPITAL, PONTYPRIDD.—The opening of the isolation hospital erected by the Pontypridd District Council at Llantwit Fardre was performed by Sir Alfred Thomas, M.P., recently. The hospital is situated on the right-hand side of the road leading from Tonteg to Llantwit Church. The hospital is built in terraces in four separate blocks, consisting of an administrative block, with accommodation for matron and for nurses; two separate pavilions, each containing a six and four bed ward, nurses' kitchen, lavatories, bathrooms, and other necessary offices, and the laundry block, which consists of washing and ironing rooms, disinfector and disinfecting rooms, mortuary, and accommodation for ambulance van. The total cost of the buildings is 6,700*l.* The work has been carried out from drawings prepared by Mr. Edward Rees, late Surveyor to the Council, acting in conjunction with Dr. Howard Davies, the Medical Officer of Health. The contractor was Mr. William Davies, Hopkinstown, the clerk of works being Mr. W. J. Davies, Pontypridd.

FREE LIBRARY, ILKESTON.—The Ilkeston Free Library has just been opened. The new building occupies a site in the Market-place. It is designed in Free Renaissance, and is built of red brick and stone. On the ground floor are a porch, space for cycles, entrance hall, lending library in the centre, with the news-room and ladies' room on the right, and reference library and magazine room on the left. On the first floor, which is reached by a stone staircase, are two rooms for students' library and patent library, with a storage gallery round the upper portion of the lending library. The librarian's house is situate in South-street, and includes a librarian's room in communication with the lending library. The staff-rooms (for both sexes), unpacking-room, magazine store, book store, heating chamber, coals, etc., are approached by a separate entrance from South-street. The building has been fitted with polished oak fittings. The borrowers' counter is 40 ft. long. The book stands and shelving will hold about 19,000 volumes; and the main rooms on the ground floor will accommodate 110 readers. The whole building is lighted throughout with electric light. The building was erected by Mr. Thomas Barlow, of Nottingham, to the designs of Messrs. Hunter and Woodhouse, of Belper and Derby.

EXTENSION OF NORTHWICH INFIRMARY.—As mid-Cheshire's memorial of the late Queen Victoria, the foundation-stone was laid on the 25th ult. of an extension of the Victoria Infirmary. The work, which will involve an outlay of about 5,000*l.*, has been designed by Mr. G. E. Bolshaw, architect, Southport and Crewe. It will provide for twelve additional beds, together with nurses' duty-rooms, operating and anæsthetic rooms, offices, sitting-rooms, etc. The annexe will be coupled up with the existing institution, and the opportunity will be taken advantage of to establish the patients' rooms (now upstairs) on the ground floor.

SHOPS, VAUXHALL BRIDGE-ROAD.—A block of shops, with residential flats over, is to be erected on the site of Nos. 258 to 266, Vauxhall Bridge-road (Victoria-street end). The building is to have a roof garden approached by electric lift. The elevation will be carried out in red brick, with brick carving and terra-cotta dressings. Messrs. Palgrave and Co., Westminster, are the architects.

BUSINESS PREMISES, DUBLIN.—The reconstructed premises of Messrs. Charles L. Reis and Co., in Grafton-street, Dublin, have just been opened. Mr. Lynn, architect, Belfast, designed the building, and the contract was carried out by Messrs. Laverty and Co., Belfast.

NEW ARCADE, BEDFORD.—The building of the new arcade between High-street and Harpur-street, Bedford, is now in progress. The work is being carried out by Mr. Cornelius Haynes, contractor, of Kempston, from the plans of Messrs. Usher and Anthony.

APPOINTMENTS.

THE CROWN SURVEYORSHIP.—The appointment of Surveyor to the Crown, rendered vacant by the recent decease of Mr. Arthur Green, who was formerly a member of the late firm of Archer and Green, has been conferred upon Mr. John Murray, F.R.I.B.A., of John-street, Adelphi, W.C.

VICTORIA AND ALBERT MUSEUM.—Consequently upon the retirement, through superannuation, of Major-General Festing, C.B., F.R.S., the President of the Board of Education has appointed Mr. W. I. Last, A.M.Inst.C.E., Senior Keeper of the Science Division of the Museum, to be Director of that division. Mr. Last has been senior keeper, with the special charge of the Engineering collections, during some years past. He gained the senior Whitworth Scholarship in 1877, and in 1887 the Watt Medal of the Institution of Civil Engineers.

CITY AND GUILDS TECHNICAL COLLEGE.—Professor W. Ernest Dalby has vacated the chair of Mechanical Engineering and Applied Mathematics at the Technical College, Finsbury, upon his appointment to the Professorship of Civil and Mechanical Engineering at the City and Guilds Central Technical College, Exhibition-road, S.W., in succession to Professor W. C. Unwin, F.R.S.

SANITARY AND ENGINEERING NEWS.

PROPOSED NEW DOCK FOR ABERDEEN.—Mr. R. Gordon Nicol, C.E., Harbour Engineer, has prepared, for the consideration of the Harbour Board, a scheme for a new dock on the Links, for the accommodation chiefly of the timber trade. The dock will be situated on the Links and foreshore behind the shipbuilding yards and to the north of Footdee-square, with an entrance from the tidal harbour on the east side of Pocra Jetty. It will form a tidal basin 1,600 ft. long, with a width of 250 ft. at one end and 500 ft. long at the other, while the depth will, in the first instance, be taken out to 15 ft. at low water of ordinary spring tides, and be deepened afterwards when found necessary. It will be protected from the sea by a strong embankment wall, extending from the beach battery to the North Pier, and the area thus reclaimed from the foreshore will provide space for the landing and storage of timber. For the construction of the dock about 16 acres of ground on the Links will have to be acquired from the Town Council, and 25 acres of foreshore from the Crown. Mr. Nicol estimates, provisionally, the cost of the dock and sea wall at 125,000*l.*, which will require to be added to the cost of the necessary land.

WATER SUPPLY, CHRIST'S HOSPITAL.—The Governors of Christ's Hospital are about to carry out the extension of their water supply by sinking a deep shaft and driving storage adits. The work will be carried out by Messrs. Duke and Ockenden, waterworks' contractors, of London and Littlehampton.

HARBOUR IMPROVEMENTS, PENNAN, N.B.—The foundation-stone was laid recently of the new pier at Pennan, which completes the scheme of improvement planned by Mr. James Barrow, C.E., Aberdeen. The new structure will be 336 ft. long, and the cost is estimated at 1,800*l.*

WATERWORKS EXTENSION, NEWBURGH, N.B.—The scheme for the provision of a supply of water to the hill district of Newburgh, and also for the purification of the whole of the town's supply, which has been in process of construction since March, under the superintendence of Messrs. Sang and Lockhart, C.E., Kirkcaldy, was opened recently. The filtration of the water is accomplished by means of two self-cleansing pressure filters.

FOREIGN.

GERMANY.—The façade of the new town hall at Dresden is to be built according to the designs of the architect, Herr Karl Roth, of Darmstadt, but the ground plans by Herr Bräter are to be utilised.——The Society of German Architects and Engineers will hold its annual meeting at Düsseldorf from September 11 to 14.

AUSTRIA.—Professor Karl Edler von Ott died on August 2 at Brünn, in his sixty-ninth year.——The restoration of the "Minoriten" church at Vienna, which was entrusted to the late Professor Luntz, is being now carried out by Herr Ritter von Giacomelli.——A new theatre is to be built at Vienna, which will be opened next spring.——Herr Wilhelm Kürschner is architect for the barracks that are to be erected at Bozen.

SWITZERLAND.—Herr G. Wülfke, architect, died at Zurich on August 13.——The Montreux-Berne Railway has been open since August 19.——The Swiss Society of Electricians held a meeting at St. Moritz on August 21 and 22; 150 members were present and fifty firms were represented.

MISCELLANEOUS.

COMPENSATION AWARD.—In his capacity of arbitrator, Mr. Ralph Clutton has just announced the terms of his award, amounting to 18,110*l.*, in respect of a claim preferred by Mr. John Murray, of Albemarle-street, Piccadilly. The controversy arose in the course of the construction of the Great Northern, Piccadilly, and Brompton Railway Company's line and the building of a station in Dover-street, with a consequent disturbance of Mr. John Murray's property and business.

THE CLOISTER OF ST. BARTHOLOMEW'S, WEST SMITHFIELD.—Complete legal possession has now been obtained of the stables in Bartholomew Close in which are buried the remains of the XVth century cloister on the south side of the Church of St. Bartholomew the Great. The work of restoration will be proceeded with by, firstly, clearing away the made ground, in an area of about 45 ft. by 15 ft., which now rises to within a short distance below the capitals of the columns; the vaulting was mutilated for the building of dwelling-rooms, when the remains were converted for stabling purposes. The arched doorway which formed an entrance into the cloister from the belfry tower, near the south transept, is at present bricked up, but it will be opened and restored to its original use.

DRURY-LANE THEATRE: L.C.C. REQUIREMENTS.—In moving the adoption of the report at the annual meeting of the Theatre Royal, Drury-lane, on Wednesday, Mr. T. H. Birch, the chairman, referred to the extensive alterations which are now being carried out at the theatre. He said that, owing to the work having to be completed before the Christmas pantomime season, the theatre would have to be closed during the whole of the autumn, so that the usual autumn drama would not be run. Mr. Birch declared that while they were in the height of their last pantomime season certain members of the London County Council went out of their way to make allegations against the safety of the theatre, without even taking the trouble to verify the facts on which they based their conclusions. Many of the requisitions of the Council were of a very unreasonable and exacting character, and they were informed by the Superintending Architect to the Council that even if the whole of the requirements were complied with he would not be satisfied. Mr. Birch went on to deal with the appeal lodged by the directors, and its result in the appointment of Mr. John Slater, F.R.I.B.A., as arbitrator. The result of arbitration had been the disallowing of many of the requirements and the modification of others, but as it was the cost of the works ordered by the arbitrator would be about 20,000*l.* or 25,000*l.* Mr. Arthur Collins, the managing director, speaking on the same topic, said that the County Council had used the fire at Chicago as a lever, but such a fire as that could never occur at Drury-lane.

CAPITAL AND LABOUR.

GLASGOW MASONS' STRIKE.—A meeting of the men was held on the 25th ult. in the Albion Halls, Glasgow, to consider the proposed arbitration, which was the outcome of the preceding day's negotiations between the labour representatives of the Corporation and the Lord Provost. It is stated that, after a prolonged discussion, it was agreed by a large majority to accept the masters' terms of 9d. per hour. A deputation was appointed to proceed to the headquarters of the federated employers in order to sign an agreement in accordance with the decision. The strike now at an end lasted for about six weeks. At the outset over 2,000 men were affected, but during the last few weeks of the strike fully half of these were restarted owing to several employers agreeing, conditionally, to the demands of the operatives.—*Scotsman.*

Legal.

ANCIENT LIGHT DISPUTE.

IN the Vacation Court on Wednesday Mr. Justice Bigham again had before him the case of Milton and another *v.* Maskelyne, on an application by the plaintiffs to restrain the defendant from so building in Langham-place, W., as to obstruct the plaintiffs' ancient lights.

Counsel stated that the parties were coming to an agreement, and asked that the motion should stand over for one week.

The application was granted.

REMOVING OLD MATERIALS AT ILLEGAL HOURS.

ON Tuesday at the Guildhall (Summons Court), before Mr. Alderman Simmons, George Tatum, builder, of Walterton-street, Harrow-road, appeared to a summons for causing certain materials—namely, old bricks—to be removed from a building in course of demolition during prohibited hours.

Police-sergeant Robt. Wilson deposed that at 1.20 on the 18th inst. he was in Arthur-street West, when he saw defendant's men carrying baskets of old bricks and shooting them into a cart. Having spoken to defendant's foreman some days previously, he went to defendant, who said his men were not acting in defiance of the law. On the previous day (the 17th) Mr. Tatum had gone down to the police station and read the by-law under which the summons was taken out.

In answer to defendant, witness said he was sure the men were carrying old bricks, and he called Constable Martin, who corroborated his statement.

Defendant said as soon as he knew it was illegal for him to remove old building material after ten o'clock in the morning he stopped his men working at ten o'clock. It was a loss to them and to him. The loads complained of were old rubbish from the foundation and the wood from the hoarding. The building in question had been pulled down inside the hoarding. He was under a contract to get it all cleared away, and in default was liable to a penalty of 20*l.* per week. Messrs. Mowlem had been at work in Arthur-street West for three weeks, and that had hindered him. In answer to the Alderman, defendant said he had been thirty-three years in the trade. It seemed almost worth 1*l.* a brick to pull down in the City.

The Alderman said this was the first case under the new by-law for the regulation of pulling down buildings. It only came into force in July. The summons would therefore be dismissed, with a caution.

PATENTS OF THE WEEK.

APPLICATIONS PUBLISHED.*

14,374 of 1904.—D. F. HENRY, JUN.: *Continuous Kilns for Burning Fireproofing Tile, and other Clay Products.*

This consists in the combination of a kiln, having slotted walls, ware supports, movable in the kiln one above the other, each support consisting of tubular members united at their ends by manifolds, a tubular extension on each manifold projecting through the kiln slots, a combined water chamber and hanger at the outer end of each of said extensions, water supply and discharge means for each of said chambers, and carrying means to which the combined chambers and hangers are pivotally secured.

20,789 of 1903.—J. BLACKBOURN: *A Channel Way and Covers for Footpaths to Prevent Accumulation of Refuse.*

A footpath channel way, and cover therefor, consisting of a channel way of suitable section having plain vertical sides, a short, fixed covering at one end, with an aperature formed therein for receiving a down spout, one or more nuts, plates, or the like connected to, or integrally formed with, said channel way, and with or without one or more ridges formed on the tops of said sides; a removable cover, having a tongue at one end and a number of projections, and with or without a recess or recesses formed upon its underside, and provided with one or more counter-sunk holes, said cover being adapted after slipping said tongue beneath said short fixed covering of the channel way to be dropped in position thereon, and be thereat secured by one or more screws engaging said cover and nut or nuts, or the like.

22,512 of 1903.—W. HALL: *Street, and Similar Lamps.*

A street or similar lamp, fitted with a tube or pipe, terminating directly, or by branches, over a burner or burners within the lamp at one end, and at the other end extending up into a double-walled head part outside the lamp, and such head part, or its inner wall, formed with an opening, and with the space between its walls open to the atmosphere, the parts being so proportioned and arranged as to suit both for ventilation and lamp-lighting purposes.

22,769 of 1903.—N. PERPIGNANI and E. CANDLOT: *Kilns for Burning Cement, Lime, etc.*

A kiln for the burning of cement, lime, and the like, consisting of a circular grate arranged round the kiln below the combustion zone, the said grate forming cylindrical shaft and being surrounded by a casing, provided with openings for stirring the charge in the kiln.

30,003 of 1904.—G. STADE: *Process and Devices for Filtering Liquids.*

A process for filtering liquids by the utilisation of filtering material arranged at its natural incline, which process consists in causing the liquid to be filtered to first describe an angle at its escape from the filtering element, instead of being caused to flow in a straight course upon the inclined face of the filtering material, the angle causing the liquid to impinge against a solid body, so that the force of the forwardly-rushing current of liquid is broken at the said body, and is distributed in such a manner that the incline of the filtering material is prevented from taking up the main pressure at a single place, the said pressure being instead of that evenly distributed for the entire surface of the incline.

4,022 of 1904.—J. H. HATZE, J. KREUZIGER, and P. MAACK: *A Moulding box for Forming Perforated Cement Bricks.*

This invention relates to a moulding-box for forming perforated cement bricks. It has for its object to overcome the disadvantages existing in similar moulding-boxes hitherto known by permitting the readier removal of the moulded bricks. In the ordinary boxes, as at present constructed, pins for effecting the perforation are fixed to the base of the moulding-box, so that the bricks could not be pushed out of the mould sideways, but had to be lifted off the pins by raising the base-plate, by means of a treadle arrangement. This inconvenience is avoided in this moulding-box.

7,227 of 1904.—A. BIBERFELD: *Decorative Building Block or Plate.*

A process for the production of building plates or blocks which consists in cutting out and shaping to the requisite design a fabric of wire or the like and causing crystals of candy alum, rock-salt, sulphate of copper, sulphate of iron, and the like to form thereon.

13,934 of 1904.—C. FOSTER: *Scaffolds, and the Method of Erecting the same.*

A scaffold consisting in the combination of a set of flexible cables, platforms supported thereby, outriggers from which the cables are suspended, and means for making the cables fast to the said outriggers at points between their ends, the upper portions of the cables extending beyond the outriggers, whereby such portions are arranged to be continued upward and suitably supported without interfering with the platforms below such outriggers.

* All these applications are in the stage in which opposition to the grant of Patents upon them can be made.

17,029 of 1903.—W. A. C. WALLER: *Apparatus for the Manufacture of Cement Blocks or Slabs.*

An apparatus for manufacturing cement blocks or slabs, consisting of a mould having one or more moulding chambers, each of which comprises a bar forming one side of the chamber, two plates on opposite sides of the said bar, connected together and adapted to move relatively with said bar, means for effecting such relative movement, two hinged doors forming opposite sides of the chamber, and a removable bar forming a fourth side of the mould.

18,157 of 1903.—W. JONES: *Domestic Fireplace.*

Grates or mantel register grates prepared with openings at the sides to show tiles, for effectively fixing enamelled slate panels or panels of any other material over the said openings, the said means consisting essentially in fixing one end of a shaped strip of steel or other suitable material to the grate by means of a screw and nut, and by tightening up the nut to bring the other end of the strip to press upon the panel, and thereby hold the same securely in position.

18,412 of 1903.—S. RANGELEY: *Method of and Apparatus for Polishing the Surfaces of Flags, Ashlar, and the like.*

The object of this invention is to abrade and polish the surfaces of flags, window mullions, door jambs, blocks of ashlar, and the like. The invention consists in placing flags and the like in suitable frames in such a manner that, by giving a reciprocating motion to one of the frames, the outer faces of four flags or the like can be polished simultaneously, the necessary friction for abrasion being obtained by the weight of the flags and frames themselves.

18,786 of 1903.—J. TOMLINSON and S. ABRAM: *Ventilators.*

The manufacture of louvre ventilators from plastic material in one piece by pressure, consisting in forming the cores on top and bottom dies of the mould for producing the louvres of uniform configuration, each having one side vertical to the face of the die, and one inclined side so proportioned and disposed that the vertical sides of the upper die slide against those of the lower die as the article is being pressed.

20,184 of 1903.—LOCKERBIE AND WILKINSON, LTD., and C. F. GRAY: *Door Furniture.*

This consists in the combination with the door furniture of a washer mounted loosely upon the spindle, and having means of attachment to the face of the door upon the side of the adjustable handle so as to form a stop or face against which the inner side of wedge washer butts.

21,103 of 1903.—A. CORTI: *A Composition for Removing Lacquers, Varnish, Oil Paint, and the like, and Process for the Manufacture of the same.*

A process for the manufacture of a composition or paint for removing lacquer, varnish, oil varnish, oil paint, and more especially burnt lacquers, which consists in stirring into a mixture of alcohol or acetone and petroleum and soft soap, a mixture of slaked lime with potash or soda without water.

21,286 of 1903.—R. S. BRANFOOT and W. B. DAVIS: *Metallic Buckets, Baths, and other Washing Utensils.*

A bucket bath or other receptacle having a piece cut out from one side to form an opening, a pocket or opening closed on all sides save one, and the open side of the pockets fixed to the edges of this opening to form a soap tray.

13,857 of 1904.—D. BOWIE: *Apparatus for Ensuring Safety in the Working of Hoists, Lifts, and the like.*

An apparatus for ensuring safety in the working of hoists, elevators, and the like, which consists in providing vertically-sliding safety gates closing the gangways that lead to the hoist at the bottom, a trip device near the bottom of the hoist, and means for connecting said trip device with the safety gates in such a manner that the cage or other moving part of the hoist as it nears the bottom strikes the trip device and raises the gates clear of the gangway, or permits them to close by gravity on the ascent of the cage.

14,624 of 1904.—H. ALLES: *Wall Hook or Holdfast for Pipes.*

A wall hook, consisting in combination of two curved members adapted to clasp the pipe between them, one of said members being rigidly secured to the wall or the like, and the other of said members being hinged to said first member, and a lever pivoted to said first member, and adapted to engage a projection or the like on said second member, so as on turning said lever on its pivot to bring said members together to clasp said pipe.

14,656 of 1904.—R. G. HOWSON: *Water-closets, Lavatory basins, and the like.*

Water-closets, lavatory basins, and the like, consisting in the provision of carying brackets upon the wall upon which they are to be mounted, and pins, bars, or plates upon the closet basin, or the like, and means for securing the latter upon the brackets and against the wall.

14,844 of 1904.—J. NELSON: *Hinges.*

A hinge consisting of the combination of flaps for fixing same, and knuckle portions with pin or pins for connecting the separate portions thereof, and second flaps or extensions provided with or without indiarubber blocks or pneumatic cushions on one or both flaps.

3,338 of 1904.—A. PROBST: *Ceiling and Flooring.*

A floor and ceiling in which the sides of each hollow block are provided with corrugations adapted to engage with the corrugated sides of the adjacent blocks characterised, that the joints between the corrugated sides of said blocks are formed over wires fastened to the floor-beams, and carried down the centres of cross-beams, said wires being adapted to relieve the weight of the hollow blocks upon the said cross-beams.

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SOME RECENT SALES OF PROPERTY:

ESTATE EXCHANGE REPORT.

August 17.—By STRIDE & SON (at Chichester).
Oving, etc., Sussex.—Elbridge Farm, 139 a. 2 r. 9 p., f. £6,350

By SIMMONS & SONS (at Oxford).
Nether Worton, Oxon.—The Nether Worton Estate, 374 a. 3 r. 14 p., f. 3,050

August 23.—By KING & KING (at Botley).
Swanmore, etc., Hants.—Forest Farm, several cottages and enclosures, 176 a., f. (in 21 lots) 10,070

By FLEURET, SONS, & ADAMS (at Masons' Hall Tavern).
Brighton, Sussex.—York-pl., "The Northern Hotel," with stabling and shop adjoining, f., p. 13,250

August 24.—By MADDISON, MILES, & MADDISON (at Great Yarmouth).
Great Yarmouth.—Mill-rd., "Hill Mill Estate," 1 a. 1 r. 38 p., f., including building materials thereon 2,650
South Quay, freehold malting, y.r. 70*l.* 480
Stalham, Norfolk.—Wayford Bridge malting, f., y.r. 120*l.* 1,200
Hemsby, Norfolk.—Martham-rd., three freehold houses, y.r. 18*l.* 300

August 25.—By NEWBON, EDWARDS, & SHEPHARD.
Stoke Newington.—49, Darville-rd., u.t. 72 yrs., g.r. 6*l.*, e.r. 36*l.* 435
Islington.—16 to 26 (even), Greenman-st., u.t. 26 yrs., g.r. 24*l.*, y.r. 182*l.* 810
23, Barnsbury-st., u.t. 19½ yrs., g.r. 8*l.* 10s., e.r. 55*l.* 185
Holloway.—17, Upper Tollington-pk., u.t. 64 yrs., g.r. 7*l.* 10s., y.r. 42*l.* 455
33, Despard-rd., u.t. 80 yrs., g.r. 6*l.*, e.r. 32*l.* 265
Finsbury Park.—140, Stroud Green-rd., u.t. 59½ yrs., g.r. 7*l.*, e.r. 45*l.* 455
Stanmore.—Stanmore Hill, "Talbot House," f., y.r. 55*l.* 780
Stanmore Hill, "Northampton House," f., y.r. 25*l.* 510
Stanmore Hill, "Child's Cottages," area 3,000 ft., f. 220

By PERFECT & SON.
Hammersmith.—8, 9, and 10, Chancellor-st., u.t. 30 yrs., g.r. 27*l.*, w.r. 78*l.* 150
Holloway.—58, St. John's-rd., u.t. 45 yrs., g.r. 10*l.* 10s., e.r. 42*l.* 310

By STIMSON & SONS.
Brixton.—17, 18, and 19, Claribel-rd., u.t. 9½ yrs., g.r. 15*l.* 9s., y.r. 96*l.* 320
Camberwell.—55, Westmacott-st., f., w.r. 36*l.* 8s. 415
Homerton.—Durrington-rd., f.g.r. 5*l.*, reversion in 95 yrs. 115
Durrington-rd., freehold plot of building land 100
Old Kent-road.—156 and 158, Cobourg-rd., u.t. 11 yrs., g.r. 6*l.*, w.r. 75*l.* 8s. 165
Stoke Newington.—37, Bethune-rd., u.t. 70¾ yrs., g.r. 8*l.*, e.r. 60*l.* 450
Walworth.—3 and 5, Alvey-st., f., y.r. 74*l.* 8s. 700
Peckham.—127, Gloucester-rd., u.t. 38¼ yrs., g.r. 8*l.*, w.r. 39*l.* 270

Contractions used in these lists.—F.g.r. for freehold ground-rent; l.g.r. for leasehold ground-rent; i.g.r. for improved ground-rent; g.r. for ground-rent; r. for rent; f. for freehold; c. for copyhold; l. for leasehold; p. for possession; e.r. for estimated rental; w.r. for weekly rental; q.r. for quarterly rental; y.r. for yearly rental; u.t. for unexpired term; p.a. for per annum; yrs. for years; la. for lane; st. for street; rd. for road; sq. for square; pl. for place; ter. for terrace; cres. for crescent; av. for avenue; gdns. for gardens; yd. for yard; g.r. for grove; b.h. for beerhouse; p.h. for public-house; o. for offices; s. for shops; ct. for court.

PRICES CURRENT OF MATERIALS.

*** Our aim in this list is to give, as far as possible, the *average* prices of materials, not necessarily the lowest. Quality and quantity obviously affect prices—a fact which should be remembered by those who make use of this information.

BRICKS, &c.

	£ s. d.		
Hard Stocks.	1 16 0	per 1000	alongside, in river.
Rough Stocks and Grizzles	1 13 0	,,	,, ,,
Facing Stocks ...	2 12 0	,,	,, ,,
Shippers	2 10 0	,,	,, ,,
Flettons	1 10 0	,,	at railway depôt.
Red Wire Cuts ...	1 13 0	,,	,, ,,
Best Fareham Red	3 12 0	,,	,, ,,
Best Red Pressed Ruabon Facing	5 0 0	,,	,, ,,
Best Blue Pressed Staffordshire ...	4 4 0	,,	,, ,,
Do. Bullnose	4 10 0	,,	,, ,,
Best Stourbridge Fire Bricks.....	4 8 0	,,	,, ,,
GLAZED BRICKS.			
Best White and Ivory Glazed Stretchers	13 0 0	,,	,, ,,
Headers	12 0 0	,,	,, ,,
Quoins, Bullnose, and Flats.....	17 0 0	,,	,, ,,
Double Stretchers	19 0 0	,,	,, ,,
Double Headers...	16 0 0	,,	,, ,,
One Side and two Ends	19 0 0	,,	,, ,,
Two Sides and one End	20 0 0	,,	,, ,,
Splays, Chamferred, Squints	20 0 0	,,	,, ,,
Best Dipped Salt Glazed Stretchers, and Header	12 0 0	,,	,, ,,
Quoins, Bullnose, and Flats.....	14 0 0	,,	,, ,,
Double Stretchers	15 0 0	,,	,, ,,
Double Headers...	14 0 0	,,	,, ,,
One Side and two Ends	15 0 0	,,	,, ,,
Two Sides and one End	15 0 0	,,	,, ,,
Splays, Chamferred, Squints	14 0 0	,,	,, ,,
Second Quality White and Dipped Salt Glazed	2 0 0	,,	less than best.

	s. d.		
Thames and Pit Sand.....	7 3	per yard,	delivered.
Thames Ballast.....	6 0	,,	,,
Best Portland Cement	30 0	per ton,	,,
Best Ground Blue Lias Lime	21 0	,,	,,

NOTE.—The cement or lime is exclusive of the ordinary charge for sacks.

Grey Stone Lime.....12s. 0d. per yard, delivered.
Stourbridge Fireclay in sacks 27s. 6d. per ton at rly. dpt.

STONE.

	s. d.		
BATH STONE—delivered on road waggons, Paddington Depôt	1 6½	per ft. cube.	
Do. do. delivered on road waggons, Nine Elms Depôt	1 8½	,,	,,
PORTLAND STONE (20 ft. average)— Brown Whitbed, delivered on road waggons, Paddington depôt, Nine Elms depôt, or Pimlico Wharf...	2 1	,,	,,
White Basebed, delivered on road waggons, Paddington depôt, Nine Elms depôt, or Pimlico Wharf...	2 2½	,,	,,

	s. d.		
Ancaster in blocks	1 11	per ft. cube,	deld. rly. depôt.
Beer ,, ...	1 6	,,	,,
Greenshill ,, ...	1 10	,,	,,
Darley Dale in blocks...	2 4	,,	,,
Red Corsehill ,,	2 5	,,	,,
CloseburnRedFreestone	2 0	,,	,,
Red Mansfield ,,	2 4	,,	,,

YORK STONE—*Robin Hood Quality.*

Scappled random blocks	2 10	,,	,,
6 in. sawn two sides landings to sizes (under 40 ft. super.)	2 3	per ft. super.	,,
6 in. rubbed two sides ditto, ditto	2 6	,,	,,
3 in. sawn two sides slabs (random sizes)	0 11½	,,	,,
2 in. to 2½ in. sawn one side slabs (random sizes)	0 7½	,,	,,
1½ in. to 2 in. ditto, ditto	0 6	,,	,,

HARD YORK—

Scappled random blocks	3 0	per ft. cube,	,,
6 in. sawn two sides, landings to sizes (under 40 ft. super.)	2 8	per ft. super.	,,
6 in. rubbed two sides ditto	3 0	,,	,,
3 in. sawn two sides (slabs random sizes)	1 2	,,	,,
2 in. self-faced random flags	0 5	,,	,,
Hopton Wood (Hard Bed)	in blocks	2 3	per ft. cube. deld. rly. depôt.
,, ,, ,,	6 in. sawn both sides landings	2 7	per ft. super. deld. rly. depôt.
,, ,, ,,	3 in. do.	1 2½	,, ,,

SLATES.

in.	in.	£	s.	d.	
20 × 10	best blue Bangor	13	2	6	per 1000 of 1200 at r. d.
20 × 12	„ „	13	17	6	„ „
20 × 10	first quality „	13	0	0	„ „
20 × 12	„ „ „	13	15	0	„ „
16 × 8	„ „ „	7	5	0	„ „
20 × 10	best blue Portmadoc	12	12	6	„ „
16 × 8	„ „	6	12	6	„ „
20 × 10	best Eureka unfading green	15	17	6	„ „
20 × 12	„ „	18	7	6	„ „
18 × 10	„ „	13	5	0	„ „
16 × 8	„ „	10	5	0	„ „
20 × 10	permanent green	11	12	6	„ „
18 × 10	„ „	9	12	6	„ „
16 × 8	„ „	6	12	6	„ „

TILES.

	s.	d.	
Best plain red roofing tiles	42	0	per 1000 at rly. depôt.
Hip and Valley tiles	3	7	per doz. „ „
Best Brosely tiles	50	0	per 1000 „ „
Do. Ornamental tiles	52	6	„ „ „
Hip and Valley tiles	4	0	per doz. „ „
Best Ruabon red, brown, or brindled do. (Edwards)	57	6	per 1000 „ „
Do. Ornamental do	60	0	„ „ „
Hip tiles	4	0	per doz. „ „
Valley tiles	3	0	„ „ „
Best Red or Mottled Stafford shire do. (Peakes)	51	9	per 1000 „ „
Do. Ornamental do	54	6	„ „ „
Hip tiles	4	1	per doz. „ „
Valley tiles	3	8	„ „ „
Best "Rosemary" brand plain tiles	48	0	per 1000 „ „
Best Ornamental tiles	50	0	„ „ „
Hip tiles	4	0	per doz. „ „
Valley tiles	3	8	„ „ „
Best "Hartshill" brand plain tiles, sand faced.	50	0	per 1000 „ „
Do. pressed	47	6	„ „ „
Do. Ornamental do	50	0	„ „ „
Hip tiles	4	0	per doz. „ „
Valley tiles	3	6	„ „ „

WOOD. At per standard.

	£	s.	d.	
Deals: best 3 in. by 11 in. and 4 in. by 9 in. and 11 in	15	10	0	£ 16 10 0
Deals: best 3 by 4	14	10	0	15 10 0
Battens: best 2½ in. by 7 in. and 8 in., and 3 in. by 7 in. and 8 in.	11	10	0	12 10 0
Battens: best 2½ by 6 and 3 by 6	0	10	0	less than 7 in. and 8 in.
Deals: seconds	1	0	0	less thn best
Battens: seconds	0	10	0	„ „ „
2 in. by 4 in. and 2 in. by 6 in.	9	0	0	9 10 0
2 in. by 4½ in. and 2 in. by 5 in.	8	10	0	9 10 0
Foreign Sawn Boards—				
1 in. and 1¼ in. by 7 in.	0	10	0	more than battens.
¾ in.	1	0	0	„
Fir timber: best middling Danzig or Memel (average specification)	At per load of 50 ft. 4 10 0			5 0 0
Seconds	4	5	0	4 10 0
Small timber (8 in. to 10 in.)	3	12	6	3 15 0
Small timber (6 in. to 8 in.)	3	0	0	3 10 0
Swedish balks	2	15	0	3 0 0
Pitch-pine timber (30 ft. average)	3	5	0	3 15 0

JOINERS' WOOD. At per standard.

White Sea: first yellow deals, 3 in. by 11 in	23	0	0	24 0 0
3 in. by 9 in.	21	0	0	22 10 0
Battens, 2½ in. and 3 in. by 7 in.	17	0	0	18 10 0
Second yellow deals, 3 in. by 11 in.	18	10	0	20 0 0
„ „ 3 in. by 9 in.	17	10	0	19 0 0
Battens, 2½ in. and 3 in. by 7 in.	13	10	0	14 10 0
Third yellow deals, 3 in. by 11 in. and 9 in.	15	10	0	16 10 0
Battens, 2½ in. and 3 in. by 7 in.	11	10	0	12 10 0
Petersburg: first yellow deals, 3 in. by 11 in.	21	0	0	22 10 0
Do. 3 in. by 9 in.	18	0	0	19 10 0
Battens	13	10	0	15 0 0
Second yellow deals, 3 in. by 11 in.	16	0	0	17 0 0
Do. 3 in. by 9 in.	14	10	0	16 0 0
Battens	11	0	0	12 10 0
Third yellow deals, 3 in. by 11 in.	13	10	0	14 0 0
Do. 3 in. by 9 in.	13	0	0	14 0 0
Battens	10	0	0	11 0 0
White Sea and Petersburg :—				
First white deals, 3 in. by 11 in.	14	10	0	15 10 0
„ „ 3 in. by 9 in.	13	10	0	14 10 0
Battens	11	0	0	12 0 0
Second white deals, 3 in. by 11 in.	13	10	0	14 10 0
„ „ 3 in. by 9 in.	12	10	0	13 10 0
„ „ battens	9	10	0	10 10 0
Pitch-pine: deals	16	10	0	20 0 0
Under 2 in. thick extra	0	10	0	1 0 0
Yellow Pine—First, regular sizes	40	0	0	upwards.
Oddments	28	0	0	„
Seconds, regular sizes	30	0	0	„
Yellow Pine oddments	25	0	0	„
Kauri Pine—Planks, per ft. cube	0	3	6	0 5 0
Danzig and Stettin Oak Logs— Large, per ft. cube	0	2	6	0 3 6
Small „ „	0	2	3	0 2 6
Wainscot Oak Logs, per ft. cube.	0	5	0	0 5 6
Dry Wainscot Oak, per ft. sup. as inch	0	0	8	0 0 9
¾ in. do. do.	0	0	7	—
Dry Mahogany—Honduras, Tabasco, per ft. super. as inch	0	0	9	0 1 0
Selected, Figury, per ft. sup. as inch	0	1	6	0 2 6
Dry Walnut, American, per ft. sup. as inch	0	0	10	0 1 0
Teak, per load	17	0	0	21 0 0
American Whitewood Planks, per ft. cube	0	4	0	—
Prepared Flooring—	Per square.			
1 in. by 7 in. yellow, planed and shot	0	13	6	0 17 6
1 in. by 7 in. yellow, planed and matched	0	14	0	0 18 0
1¼ in. by 7 in. yellow, planed and matched	0	16	0	1 0 0

WOOD (*continued*). Per square.

	£	s.	d.		£	s.	d.
1 in. by 7 in. white, planed and shot	0	12	0		0	14	6
1 in. by 7 in. white, planed and matched	0	12	6		0	15	0
1¼ in. by 7 in. white, planed and matched	0	15	0		0	16	6
¾ in. by 7 in. yellow, matched and beaded or V-jointed brds.	0	11	0		0	13	6
1 in. by 7 in. do. do.	0	14	0		0	18	0
¾ in. by 7 in. white do. do.	0	10	0		0	11	6
1 in. by 7 in. do. do.	0	11	6		0	13	6

6 in. at 6½d. to 9d. per square less than 7 in.

JOISTS, GIRDERS, &c.

	In London, £	s.	d.		or delivered Railway Vans, per ton. £	s.	d.
Rolled Steel Joists, ordinary sections	6	5	0	...	7	5	0
Compound Girders, ordinary sections	8	2	6	...	9	5	0
Angles, Tees and Channels, ordinary sections	7	17	6	...	8	17	0
Flitch Plates	8	5	0	...	8	15	0
Cast Iron Columns and Stanchions including ordinary patterns	7	2	6	...	8	5	0

METALS. Per ton, in London.

	£	s.	d.		£	s.	d.
IRON—							
Common Bars	7	5	0	...	7	15	0
Staffordshire Crown Bars, good merchant quality	7	15	0	...	8	5	0
Staffordshire "Marked Bars"	10	0	0	...	—		
Mild Steel Bars	8	15	0	...	9	5	0
Hoop Iron, basis price	9	5	0	...	9	10	0
„ „ Galvanized	17	10	0	...	—		
(*And upwards, according to size and gauge.)							
Sheet Iron, Black—							
Ordinary sizes to 20 g.	9	15	0	...	—		
„ „ 24 g.	10	15	0	...	—		
„ „ 26 g.	12	5	0	...	—		
Sheet Iron, Galvanised, flat, ordinary quality—							
Ordinary sizes—6 ft. by 2 ft. to 3 ft. to 20 g.	12	15	0	...	—		
Ordinary sizes to 22 g. and 24 g.	13	5	0	...	—		
„ „ 26 g.	14	5	0	...	—		
Sheet Iron, Galvanised, flat, best quality—							
Ordinary sizes to 20 g.	16	0	0	...	—		
„ „ 22 g. and 24 g.	16	10	0	...	—		
„ „ 26 g.	18	0	0	...	—		
Galvanised Corrugated Sheets—							
Ordinary sizes 6 ft. to 8 ft. 20 g.	12	10	0	...	—		
„ „ 22 g. and 24 g.	13	0	0	...	—		
„ „ 26 g.	13	15	0	...	—		
Best Soft Steel Sheets, 6 ft. by 2 ft. to 3 ft. by 20 g. and thicker	11	15	0	...	—		
Best Soft Steel Sheets, 22 g. & 24 g.	12	15	0	...	—		
„ „ 26 g.	14	0	0	...	—		
Cut nails, 3 in. to 6 in.	9	0	0	...	9	10	0

(Under 3 in., usual trade extras.)

LEAD, &c. Per ton, in London.

	£	s.	d.		£	s.	d.
LEAD—Sheet, English, 3lb. and up	14	10	0	...	—		
Pipe in coils	15	0	0	...	—		
Soil pipe	17	10	0	...	—		
Compo pipe	17	10	0	...	—		
ZINC—Sheet—							
Vieille Montagne ton	27	10	0	...	—		
Silesian	27	5	0	...	—		
COPPER—							
Strong Sheet per lb.	0	0	10	...	—		
Thin „ „	0	0	11	...	—		
Copper nails „	0	0	10	...	—		
BRASS—							
Strong Sheet „	0	0	9½	...	—		
Thin „ „	0	0	10	...	—		
TIN—English Ingots „	0	1	3½	...	—		
SOLDER—Plumbers' „	0	0	6½	...	—		
Tinmen's „	0	0	8	...	—		
Blowpipe „	0	0	9	...	—		

ENGLISH SHEET GLASS IN CRATES.

15 oz. thirds	2¾d. per ft. delivered.
„ fourths	1¾d. „ „
21 oz. thirds	3¼d. „ „
„ fourths	2¼d. „ „
26 oz. thirds	4d. „ „
„ fourths	3¼d. „ „
32 oz. thirds	5d. „ „
„ fourths	4¼d. „ „
Fluted Sheet, 15 oz.	3d. „ „
„ 21 oz.	4d. „ „
⅛ Hartley's Rolled Plate	1¾d. „ „
⅛ „ „ „ „	2d. „ „
¼ „ „ „ „	2¼d. „ „

OILS, &c.

		£	s.	d.
Raw Linseed Oil in pipes	per gallon	0	1	7
„ „ „ in barrels	„	0	1	8
„ „ „ in drums	„	0	1	10
Boiled „ „ in pipes	„	0	1	9
„ „ „ in barrels	„	0	1	10
„ „ „ in drums	„	0	2	0
Turpentine, in barrels	„	0	3	6
„ in drums	„	0	3	8
Genuine Ground English White Lead	per ton	18	15	0
Red Lead, Dry	„	18	10	0
Best Linseed Oil Putty	per cwt.	0	6	6
Stockholm Tar	per barrel	1	12	0

VARNISHES, &c. Per gallon.

	£	s.	d.
Fine Pale Oak Varnish	0	8	0
Pale Copal Oak	0	10	6
Superfine Pale Elastic Oak	0	12	6
Fine Extra Hard Church Oak	0	10	0
Superfine Hard-drying Oak, for seats of Churches	0	14	0
Fine Elastic Carriage	0	12	6
Superfine Pale Elastic Carriage	0	16	0
Fine Pale Maple	0	16	0
Finest Pale Durable Copal	0	18	0
Extra Pale French Oil	1	1	0
Eggshell Flatting Varnish	0	18	0
White Copal Enamel	1	4	0
Extra Pale Paper	0	12	0
Best Japan Gold Size	0	10	6
Best Black Japan	0	16	0
Oak and Mahogany Stain	0	9	0
Brunswick Black	0	8	6
Berlin Black	0	16	0
Knotting	0	10	0
French and Brush Polish	0	10	0

TO CORRESPONDENTS.

F. R. H. (Amount should have been stated).——F. P.—T. W. (Below our limit).

NOTE.—The responsibility of signed articles, letters, and papers read at meetings rests, of course, with the authors.

We cannot undertake to return rejected communications; and the Editor cannot be responsible for drawings, manuscripts, or other documents sent to or left at this office, unless he has specially asked for them.

Letters or communications (beyond mere news items) which have been duplicated for other journals are NOT DESIRED.

All communications must be authenticated by the name and address of the sender, whether for publication or not. No notice can be taken of anonymous communications.

We are compelled to decline pointing out books and giving addresses.

Any commission to a contributor to write an article, or to execute or lend a drawing for publication, is given subject to the approval of the article or drawing, when received, by the Editor, who retains the right to reject it if unsatisfactory. The receipt by the author of a proof of an article in type does not necessarily imply its acceptance.

All communications regarding literary and artistic matters should be addressed to THE EDITOR; those relating to advertisements and other exclusively business matters should be addressed to THE PUBLISHER, and *not* to the Editor.

TENDERS.

Communications for insertion under this heading should be addressed to "The Editor," and must reach us *not later than* 10 *a.m. on Thursdays.* [N.B.—We cannot publish Tenders unless authenticated either by the architect or the building-owner; and we cannot publish announcements of Tenders accepted unless the amount of the Tender is stated, nor any list in which the lowest Tender is under 100*l.*, unless in some exceptional cases and for special reasons.]

* Denotes *accepted.* † Denotes *provisionally accepted.*

BATH.—Alterations and decoration, Syncombe House, for Mr. G. H. B. Moger. Mr. E. S. Payton, architect and surveyor, 3, Wood-street, Bath:—

J. Long & Sons	—	—	£710 0
Wills & Sons	—	—	559 0
Pratt & Co., Bath*	£387	£165 0*	552 0
F. Parsons	350	166 10	516 10
W. Webb, Bath*	333*	163 10	496 10
Cotterell Bros.	—	217 10	—
Knight & Son	—	160 0	—

BATH.—For alterations and decoration, drainage, etc., 10, Lama-place, Bath, for Messrs. F. H. & R. A. Moger. Mr. E. S. Payton, architect, 3, Wood-street, Bath:—

Cotterell's, Ltd.	£545	Parsons, Bath*	£520
Knight & Son	545	Amery‡	425
Wills & Sons	529		

‡ Withdrawn.

BATH.—For addition, bath-room, etc., 32, Brock-street, Bath, for Mr. Duncan Harding. Mr. E. S. Payton, architect, 3, Wood-street, Bath:—

West	£184 0	Long & Son	£124 0
Webb	145 0	Wills & Sons, Bath*	119 10
Parsons	139 0		

BLACKADON.—For painting, etc., the Asylum Buildings at Blackadon, near Ivybridge, for the Visiting Committee:—

J. H. Hosking, Charlotte-street, Moricetown, Devonport* £132

BRIDGWATER.—For removing existing stone arch and the substitution of steel flooring, etc., to cradle-bridge over King's Sedgmoor drain, for the Somersetshire Drainage Commissioners. Mr. Wm. Lunn, A.M.I.C.E., Bridgwater, Engineer to the said Commissioners:—

Gleed Bros.	£189 10 0	A. Stevens	£105 0 0
J. Culverwell	180 5 0	Pittard & Son, Langport*	102 15 0
F. Huish	120 0 0		

BRISTOL.—For erecting a new surgery, for Dr. James Young, St. George. Mr. W. H. Watkins, architect, 15, Clare-street, Bristol:—

T. R. Lewis	£622	C. A. Hayes	£507
E Clark	620	J. Perkins	504
Neale Bros.	580	E. Love	502
G. Humphreys	565	A. J. Beaven	489
Bennett Bros.	560		

BRISTOL.—For a private school at Burnham, Somerset, for Mr. T. Spencer. Mr. T. J. Moss-Flower, C.E., architect and surveyor, Carlton-chambers, Baldwin-street, Bristol. Quantities by Mr. W. L. Bernard, St. Stephen's-chambers, Bristol:—

H. W. Pollard	£9,300	R. F. Ridd	£8,593
J. Perkin & Sons	8,795	T. Stockham	7,998
W. Cowlin & Son	8,717	Chancellor & Sons, Bath*	7,790
C. Taylor	8,600		

BRISTOL.—For electric lighting, wiring, and fittings at Nynehead Court, Wellington, Somerset, for Mr. G. S. Lysaght. Mr. T. J. Moss-Flower, C.E., engineer, Carlton-chambers, Baldwin-street, Bristol:—

Stansell & Sons, Taunton* £754

Oil Engine.

Petter & Sons, Yeovil and Bristol* 257

BRITON FERRY.—For supply of road metalling, for the Urban District Council. Mr. H. Alex. Clarke, Engineer and Surveyor, Council Offices, Briton Ferry:—

	Per ton. Gauge 2-in.	Per ton. 1½-in.	Per ton. Chippings.	
L. Summerfield	8 6	8 9	7 3	Granite.
J. Runnalls	8 0	8 0	6 0	Penlee Basalt.
Porthgain Quarries	7 0	7 0	7 0	Granite.
J. E. Griffith	6 0	6 3	6 0	Limestone.
T. Ellis	5 8	—	5 11	„
T. Jenkins & Sons	5 7	5 7	5 7	„
W. P. Powell & Co., Hirwain*	5 0	5 0	5 0	„

TENDERS—*Continued on page* 261

COMPETITIONS, CONTRACTS, AND PUBLIC APPOINTMENTS.

(For some Contracts, &c., still open, but not included in this List, see previous issues.)

COMPETITION.

Nature of Work.	By whom Required.	Premiums.	Designs to be Delivered
*New Public Offices	Wallasey U.D.C.	250*l.*, 75*l.*, and 50*l.*	Oct. 31

CONTRACTS.

Nature of Work or Materials.	By whom Advertised.	Forms of Tenders, etc., supplied by	Tenders to be Delivered
Shooting Lodge, Carr Bridge, Duthil	Strathspey Estate	Strathspey Estate Office, Grantown, N.B.	Sept. 5
Painters' Works to Roofs of Cattle Market	Glasgow Corporation	City Engineer, City-chambers, 64, Cochrane-street, Glasgow	do.
60 Lockers, 6 Cupboards, etc., Gravelly Hill Wkhse.	Aston Guardians	At Workhouse	do.
Thirty-seven Cottages at Mountain Ash	Averffrwd Cottage Co.	Morgan & Elford, Architects, Mountain Ash	do.
Thirty-six Cottages at Mountain Ash	Park Cottage Co.	do.	do.
Fitting-up Poorhouse, Oldmill	Aberdeen City Parish Council	Brown & Watt, Architects, 17, Union-terrace, Aberdeen	do.
Engine House and Bed, Albion Mills, Idle	W. Samuel	J. H. Bakes, Architect, Calverley-chambers, Victoria-sq., Leeds	do.
Seven Brick Dwelling-houses, Nanthir Est., Blaengarw	The Committee	Owner, 16, Brynbedw-terrace, Blaengarw	do.
Primitive Methodist Church, Eyemouth	Southend Masonic Hall Co.	W. Gray & Nephew, Architects, 2, Ivy-place, Berwick-on-Tweed	do.
Heating Barham Chapel, Beaufort	Barking Town U.D.C.	L. Jones, Architect and Surveyor, Beaufort	do.
Extension of Masonic Club Premises, The Broadway	do.	J. Thompson, Architect, Preston-road, Southend-on-Sea	do.
Rails, Fishplates, and Bolts	do.	H. Hargreaves, Clerk, Public Offices, Barking, Essex	Sept. 6
Permanent Way Construction	do.	do.	do.
Overhead Line Equipment	do.	do.	do.
Underground Feeder Cables	U.D.C.	Surveyor, Council Office, Church-road, Burgess Hill	do.
Stabling, etc., Clifton-road Depôt, Burgess Hill	Shoeburyness U.D.C.	S. Dyer, Architect, 29, Quay-road, Bridlington	do.
Re-making, etc., Sewer by Crescent, Bridlington	St. Thomas R.D.C.	F. Gregson, Clerk, Southend-on-Sea	do.
200 Tons of Broken Granite	Edinburgh School Board	D. Cameron, Engineer, 7, Bedford-circus, Exeter	Sept. 7
Water Supply, Otterton	The Managers	J. Arnot, Clerk, Castle-terrace, Edinburgh	do.
Apparatus, Boroughmuir High Grade School	Glamorgan County Council	T. B. Silcock & S. S. Reay, Architects, 47, Milsom-street, Bath	do.
Additions, etc., Newtown British Schools, Trowbridge	do	Glamorgan County Council Offices, Cardiff	do.
Morriston to Pontardawe Road Widening	Aberdeen Harbour Commissioners	do.	do.
Widening Pontardawe, etc., Road, at Gelligron	Rhondda U.D.C.	R. Gordon Nichol, Engineer, Harbour Engineer's Office, Aberdeen	do.
1,000 Tons of Portland Cement	Orsett R.D.C.	W. Beddoe Rees, Architect, 37, St. Mary-street, Cardiff	do.
English Pres. Ch., etc., Ithon-rd., Llandrindod Wells	Lanark Upper Ward District Com.	W. J. Jones, Surveyor, Public Offices, Pentre, Rhondda	do.
Scavenging for One Year	Swansea Guardians	S. I. Adams, Surveyor, Weston-chambers, Southend-on-Sea	do.
Street Works, Stanford-le-Hope, Essex	Hale U.D.C.	Warren & Stuart, Engineers, 94, Hope-street, Glasgow	do.
1¼ Miles Cast-Iron Pipes and Service Tank	Burslem Town Council	L. Jenkins, Clerk, Union Offices, Alexandra-road, Swansea	do.
Ventilation of Dining-rooms, etc., Workhouse	do.	D. Ronald, Burgh Engineer, Burgh-buildings, Falkirk	do.
Macadamising Streets, Falkirk, Scotland	Southend-on-Sea Corporation	T. Blagburn, Surveyor, Hale, Cheshire	do.
Making-up Queen's-road, Hale	Leeds Corporation	Borough Surveyor's Office, Queen-street, Burslem	Sept. 8
Electric Lighting Station	Wimbledon U.D.C.	do.	do.
Brick Chimney Shaft, 120 ft. high	Woolwich Guardians	E. J. Elford, Borough Surveyor, Southend-on-Sea	do.
Making-up Streets	Rothwell U.D.C.	City Engineer's Office, Municipal-buildings, Leeds	do.
Paving and Flagging Streets	Coventry Persev. Co-op. Soc., Ltd.	C. H. Cooper, Engineer, Council Offices, Broadway, Wimbledon	do.
Roofing Extension, Tipping Platform, Dust Works	Guardians	T. Cutler, Clerk, Union Offices, Woolwich	do.
200 Tons of Spalls	Nottingham Health Committee	Market House, Rothwell, Kettering	do.
Purifier, 10 ft. by 10 ft.	Yorkshire Inebriates Act Jt. Com.	Harrison & Hattrell, Architects, 23, Hartford-street, Coventry	Sept. 9
Shop and Stores, London-road, Coventry	Aslackby, etc., Drainage Board	A. J. Harris, Clerk, Queen's-chambers, Cardiff	do.
Building Materials, etc., Cardiff Workhouse	do.	F. B. Lewis, City Architect, Guildhall, Nottingham	do.
Urinals, Ilkeston-road, Radford etc.	do.	J. Vickers Edwards, Architect, County Hall, Wakefield	do.
Furnishing Inebriates' Reformatory, Cattal	Admiralty	G. Smith, Clerk, Horbling, Folkingham	do.
Sluice and Pump Well	do.	do.	do.
Corrugated Iron Engine-house	do.	F. Sanderson-Robins, C.E., 5, Horncastle-road, Boston, Lincs.	do.
25-n.h.p. Engine and 30-in. Pump	Wath-upon-Dearne U.D.C.	Superintending Engineer, H.M. Dockyard, Portsmouth	do.
*New Coastguard Buildings at Hove	Select Vestry	Director of Works Dept., Admiralty, 21, Northumberland-ave., W.C.	do.
*New Coastguard Buildings at Barrow-in-Furness	Glasgow Corporation	Supt. Engr., H.M. Naval Estb., Rosyth, near Inverkeithing, N.B.	do.
*New Coastguard Buildings at Fifeness	Stockton-on-Tees Guardians	H. C. Poole, Surveyor, Town Hall, Wath-upon-Dearne	Sept. 10
Tar Paving or Asphalte (2,000 sq. yds.)	Ryton U.D.C.	Moynan & Gill, Architects, Nenagh	do.
Schoolhouse and Residence, Nenagh, Ireland	Holsworthy Guardians	J. R. Sutherland, Engineer, 45, John-street, Glasgow	do.
800 Tons Cast-Iron Pipes	Warrington Paving, etc., Committee	J. Rodham, 16, Tinkle-street, Stockton-on-Tees	do.
Alterations to Children's Homes, Hartington-road	Dublin Corporation	J. P. Dalton, Surveyor, Ryton-on-Tyne	Sept. 12
Cartage of Road Material	Manchester Rivers Committee	C. Kinsman, Clerk, 12, Chapel-street, Holsworthy	do.
Fire Escapes, etc., at Workhouse	do.	T. Longdin, Borough Surveyor, Town Hall, Warrington	do.
Forming and Paving Streets and Passages	Leeds Guardians	City Treasurer, Municipal Buildings, Cork Hill, Dublin	do.
Workmen's Dwellings, Mooney's-lane, Clontarf	do.	Secretary of Rivers Department, Town Hall, Manchester	do.
353,300 Common and Blue Bricks	Nottingham Public Pks. Committee	do.	do.
Ironwork, Valves, etc.	Ilford R.D.C.	T. Winn & Sons, Architects, 92, Albion-street, Leeds	do.
Electric Sub-station & Subways, Wkhse., Beckett-st.	Liverpool Select Vestry	do.	do.
Wiring Install. and Subway, etc., for Hospital Bldgs.	Warblington U.D.C.	F. G. Webb, Architect, Holly Bush, Lower Machen, Mon.	do.
Alterations, etc., Wesleyan Church, Machen	Settle R.D.C.	F. B. Lewis, City Architect, Guildhall, Nottingham	do.
Public Conveniences, Bulwell Forest	Torquay Town Council	H. Shaw, Surveyor, Town Hall, Ilford	do.
Extension of Buildings, Ley-st. Elec. Lighting Sta.	The Corporation	H. J. Hagger, Parish Offices, Brownlow Hill, Liverpool	do.
Stores	West Ham Corporation	H. W. Stringfellow, Surveyor, Public Offices, Emsworth	do.
Paving, Emsworth, Hants	East India Ry. Co.	Luke Bell, Highway Surveyor, Town Hall, Settle	do.
Diversion of 590 lineal yds. of Highway, Colgarth Hill	do.	Borough Engineer, Town Hall-chambers, Torquay	do.
*Erection of Chimney Shaft	S. Staff. Small-Pox Hospital Board	J. J. Webster, Engineer, 39, Victoria-street, Westminster	Sept. 13
Widening Warrington Bridge	Wallasey U.D.C.	W. J. W. Bullock, Electrical Engr., Electrical Wks., Canning Town	do.
Electrical Equipment of Tramway Track	N.E. Ry. Co.	C. W. Young, Secretary, Nicholas-lane, London, E.C.	Sept. 14
Through Spans (110 ft. in the clear)	do.	do.	do.
Coal Waggons and Wheels and Axles	Kinsale R.D.C.	G. Green, Town Hall, Wolverhampton	do.
Small-Pox Hospital, Bradley, Bilston	Buntingford R.D.C.	J. A. Crowther, Seaview-road, Liscard, Cheshire	do.
High-Tension Switch Gear for Sub-Station	Commissioners of H.M. Works, etc.	W. Bell, Company's Architect, York	do.
Twenty-three Cottages on Hull and Selby Railway	Maldens and Coombe U.D.C.	do.	do.
Additions, etc., to Parcels Office, Harrogate	do.	R. Evans, C.E., 53, Southmall, Cork	do.
Public Water Closets, etc., Crosshaven	do.	E .G. Thody, Surveyor, Buntingford	do.
383 yds. of 9-in. Pipe Sewer, etc.	Bradford Gas Committee	Superintendent of Mercantile Marine, Newcastle-on-Tyne	do.
*New Mercantile Marine Office, Newcastle-on-Tyne	Wimbledon U.D.C.	District Surveyor, Council Offices, New Malden	Sept. 15
Road Materials	Lancaster Streets Committee	do.	do.
Team Labour and Steam Rolling	Southgate U.D.C.	do.	do.
Ironmongery, etc.	Worsley U.D.C.	Mill-street Gasworks	do.
Stores	Edinburgh Tramways Co., Ltd.	C. H. Cooper, Engineer, Council Offices, Broadway, Wimbledon	Sept. 16
Making-up Roads	King's Norton, etc., U.D.C.	J. C. Mount, Borough Surveyor, Town Hall, Lancaster	do.
Ramparts Railing (800 yds.)	Erith U.D.C.	Council's Surveyor, Palmer's Green, N.	do.
*Making-up Private Streets, Bowes Park	Camberwell Borough Council	S. Hill, Architect, Green-lane, Redruth	Sept. 17
Farm House, etc., Walla and Crylla, Liskeard		J. A. Corson, Engineer, District Offices, Walkden	do.
Sewage Disposal Wks., Barton Old Hall Sewage Farm		J. E. Pitcairn, 1, South Charlotte-street, Edinburgh	Sept. 19
600 Tons of Cable Ropes		A. W. Cross, Engineer, 23, Valentine-road, King's Heath, B'ham.	do.
Depot, including Fire Sta., Silver-st., King's Heath		Scorer & Gamble, Architects, Bank-street-chambers, Lincoln	do.
Additions to Elementary Schools, Barnetby-le-Wold		Surveyor, Bexley-road, Erith	do.
Street Works, Crabtree Manor Way, Belvedere		Council's Engineer, Town Hall, Camberwell	do.
*Additions to Nunhead Library			

CONTRACTS.—*Continued.*

Nature of Work or Materials.	By whom Advertised.	Forms of Tender, etc., supplied by	Tenders to be delivered
*Destructor Buildings and Chimney Shaft	Acton District Council	Council's Surveyor, 57, High-street, Acton, W.	Sept. 20
Deep-Bored Well and Catchment, Roxby-cum-Risby	Scunthorpe U.D.C.	A. M. Cobban, Engineer, Scunthorpe, via Doncaster	do.
Rails, Fish Plates, and Bolts	Barking Town U.D.C.	H. Hargreaves, Clerk, Public Offices, Barking, Essex	do.
Permanent Way Construction	do.	do.	do.
Overhead Line Equipment	do.	do.	do.
Underground Feeder, Cables, etc.	do.	do.	do.
Drainage, etc., London Road Improvement Scheme	do.	C. F. Dawson, Surveyor, Public Offices, Barking	do.
*Making-up Epious-mews	Fulham Borough Council	Borough Surveyor, Town Hall, Fulham, S.W.	Sept. 21
*New Coastguards Buildings, near Lands End	Admiralty	Superintending Civil Engineer, H.M. Dockyard, Devonport	Sept. 23
*Making-up Westbourne-road	Beckenham U.D.C.	Council's Surveyor, Beckenham	Sept. 26
Municipal Buildings, Market-street, Leigh, Lancs.	Corporation	J. C. Prestwich, Architect, Bradshawgate-chambers, Leigh	Sept. 28
Sewer Works at Plumstead (Contract C)	The L.C.C.	M. Fitzmaurice, Engineer, County Hall, Spring-gardens, S.W.	Oct. 4
Condenser, Piping, etc., L.C.C. Tramways	do.	County Hall, Spring Gardens, S.W.	do.
Pumping Plant	do.	do.	do.
Additions, etc., Advie Parish Church	.....	J. Robertson, Architect, Inverness	No date.
Eight Small Dwelling-Houses, Carrfield-street, Heeley	Sheffield Brick Co., Ltd.	G. Buck, Architect, 4, East-parade, Sheffield	do.
Sewage Purification Works	Lockerbie Town Council	W. Allan Carter, C.E., 14, Queen-street, Edinburgh	do.
Three Terrace Houses in Blenheim-square, Leeds	A. Lonsdale	Messrs. Mosley, 6, Wormald-row, Leeds	do.
Shop, Stores, etc., Gray's Hill, Bangor, co. Down	.....	N. Fitzsimmons, Architect, 13, Lombard-street, Belfast	do.
Cem., Plaster, etc., Wareho., Pothouse Qy., Carmarthen	.....	Yorkshire Hennebique Contracting Co., Ltd., East-parade, Leeds	do.
Repairs of Roof of Locomotive Works, Darlington	.....	R. Stephenson & Co., Ltd., Darlington	do.
Alteration, etc., of Roof do.	.....	do.	do.
Alterations, etc., to Dynevor Arms, Llancaiach, Glam.	Griffiths Bros., Ltd.	Lansdowne & Griggs, Archs., Metro. Bank-chbrs., Newport, Mon.	do.
Alter. to Prem., 238-242, Beverley-rd., Stepney, Hull	G. F. Bristow	T. Brownlow Thompson, Architect, 15, Parliament-street, Hull	do.
Sewer Works, Blackwell, near Alfreton	Blackwell R.D.C.	H. Silcock, 67, West-gate, Mansfield	do.
Making-up Cordwallis-street, Maidenhead	.....	Butler & Sons, High-street, Maidenhead	do.
*Erection of Block of Shops, etc., Vauxhall Bridge-rd.	Palgrave & Co.	.....	do.
*Extensions to Ham and Bacon Factory, Harrow	Messrs. J. Adamson & Co., Ltd.	Johnstone Bros., Architects, 39, Lowther-street, Carlisle	do.

PUBLIC APPOINTMENTS.

Nature of Appointment.	By whom Advertised.	Salary.	Applications to be in
*Clerk of Works	Staffs. Education Committee	3*l.* 3s. per week	Sept. 10
*General Foreman	Public Works Depart., N. Nigeria	250*l.* per annum	do.
*Assistant-Instructor in Manual Training	Battersea Polytechnic	100*l*	No date.

Those marked with an asterisk (*) are advertised in this Number. *Competitions*, iv. *Contracts*, iv. vi. viii. x. *Public Appointments*, xviii. xix.

TENDERS.—*Continued from page* 259.

CAERLEON.—For extensions and alterations of Williams' Endowed Schools, for the Governors. Messrs. Lansdowne & Griggs, architects, Metropolitan Bank-chambers, Newport:—

R. Clements & Co.	£6,810 0 0
Passmore & Perkins	6,485 12 0
Williams & Carnall	6,224 0 0
W. Bowers & Co.	6,158 10 0
H. Thomas & Son	6,035 0 0
A. S. Morgan & Co.	5,735 0 0
E. C. Jordan	5,721 0 0
A. J. Colborne	5,694 11 0
J. J. Partridge	5,677 0 0
D. W. Richards, Ltd.	5,652 0 0
W. A. Linton	5,615 0 0
J. Linton & Co., Ltd.	5,592 0 0
J. Charles	5,550 0 0
C. H. Reed	5,384 0 0
Jerrett & Fisher	5,184 0 0

CARDIFF.—For pulling down premises and erecting new schools in David-street. Mr. E. W. M. Corbett, architect, Castle-street, Cardiff:—

Passmore & Perkins	£10,749 0 0	J. Allan & Sons	£5,479 18 7
T. Howells	6,784 10 0	W. Thomas & Co.	5,397 0 0
Latty & Co.	6,335 0 0	J. H. Venning	5,390 0 0
D. W. Davies	6,295 0 0	G. Beames, Cardiff*	5,196 0 0
Knox & Wells	5,774 0 0		
J. Gibson	5,759 0 0		
D. Davies	5,721 0 0		

CARLISLE.—For erecting two stone bridges, etc. (Powmaughan bridges, Cotehill), for the Rural District Council. Mr. J. Graham, engineer, Bank-chambers, Bank-street, Carlisle:—

W. Batey, West Walls, Carlisle £820

CHISLEDON.—For erecting a farmhouse at Middle Farm, Chisledon, Wilts. Messrs. W. Drew & Sons, architects and surveyors, 28, Regent-circus, Swindon. Quantities by the architects:—

W. E. Piper, Marlborough* £1,326 3 0

[Seven Tenders received.]

CUSTOM HOUSE.—For erecting a library in the Council's Recreation Ground, Prince Regent's-lane, for the West Ham Corporation:—

A. E. Symes	£5,700 0 0
W. E. Champion	5,540 1 2
S. E. Moss & Co.	5,196 0 0
Horlock & Son	5,115 0 0
W. E. Westgate	5,038 15 3
E. Brady	5,014 5 8
Leslie & Co., Ltd.	4,917 0 0
W. J. Maddison	4,879 0 0
B. E. Nightingale	4,776 0 0
R. A. Dean & Co.	4,653 16 0
H. J. Carter	4,636 0 0
A. Faulks	4,628 15 0
Corporation of West Ham, Works Department	4,599 0 0
Lawrence & Son	4,593 0 0
J. W. Jerram	4,511 0 0
Gregar & Son, Stratford*	4,487 0 0

DEVONPORT.—For alterations, painting, plastering, etc., at the Guildhall, for the Town Council. Mr. J. F. Burns, Borough Surveyor, Devonport:—

F. J. Stanbury	£533 0	R. W. Pitcher & Son, Devonport*	£428 5
T. Jenkin & Son	470 0		
W. E. Blake	462 0		

DEWSBURY.—For paving, flagging, etc., Reservoir-street and Greenwood-street, for the Corporation. Mr. Henry Dearden, Borough Surveyor. Quantities by Surveyor:—

Reservoir-street.

S. Bedford & Son, Huddersfield-road, Halifax* £1,411 1 8

Greenwood-street (part).

S. Bedford & Son, Huddersfied-road, Halifax* £61 1 6

FEATHERSTONE.—For erecting an isolation hospital, for the Normanton and District Joint Isolation Hospital Committee. Mr. W. Hamilton Fearnley, architect, Station-lane, Featherstone. Quantities by Messrs. G. Connell & Son, Newcastle-upon-Tyne:—

A. Lyons	£16,743 18 6	Walker & Ward	£14,450 3 10
C. Murgatroyd & Sons	16,550 0 0	Salmon & Co.	14,350 4 6
D. Gill & Son	15,970 0 0	G. Clements	13,981 0 0
R. Leake & Sons	15,479 6 6	W. Judge	13,680 14 9
J. T. Wright	15,045 10 0	T. G. Wright & Sons	13,632 18 8
F. W. Denholm & Co.	14,845 7 4	Arnold & Sons	13,410 0 0
A. Graham & Sons	14,729 18 8	Gallager Bros. and others, Castleford*	13,039 6 7
A. Thompson	14,618 12 5		
J. Pullan	14,531 0 0		

[Architect's estimate, £12,543 4s. 6d.]

GILLINGHAM (Kent).—For erecting ten cottages in Chatsworth-road. Mr. E. J. Hammond, C.E., architect and surveyor, 21, Balmoral-road, Gillingham:—

W. W. Hammond £1,985
J. Wilford, Snodland, near Rochester* 1,890

HALLING.—For extension and alteration to the pumping-station, Halling, Kent, for the Mid-Kent Water Company. Mr. E. J. Hammond, architect, Gillingham, Kent. Quantities by the architect:—

J. A. Davison, West Malling* £867 7 0

HANLEY.—For new post office, Hanley:—

D. Roberts	£13,490	T. Godwin	£10,899
C. Cornes & Sons	12,775	Messrs. Meiklejohn	9,179

HENSINGHAM.—For street works, Bedford-street and West-view, for the Whitehaven Rural District Council. Mr. G. Boyd, C.E., 33, Queen-street, Whitehaven:—

J. Dawson, Wood House, Whitehaven* .. £383 9 6

KENDAL.—For sewerage works, for the Corporation. Mr. R. Hampton Clucas, C.E., Kendal. Quantities by engineer:—

W. Canadice £242 18 1
H. W. Dirken, Parr-street, Kendal* 220 9 1

LONDON.—For external structural renovation to St. Alfege Church, Greenwich (John James, architect, A.D. 1718). Messrs. Thomas Dinwiddy & Sons, architects, Parliament-street and Greenwich:—

Killby & Gayford* £559

For Renewal of Parapet.

Killby & Gayford* £69

LONDON.—For the erection of a studio at 22, Aubrey-walk, Kensington, for Mr. A. Withers. Messrs. Selby & Kislingbury, architects, 44, Chancery-lane:—

B. Colley & Sons	£840	F. Newton	£756
Mattock & Parsons	825	J. V. Kiddle & Son	727
Barrett & Power	793	W. Tout*	665

LONDON.—For the erection of a factory in Great Alie-street, Whitechapel, for Messrs. S. and H. Harris. Messrs. Selby & Kislingbury, architects, 44, Chancery-lane. Quantities by Messrs. Northcroft, Son, & Nicholson, 9, Regent-street:—

Sykes & Son	£3,932 0	J. Grover & Son	£3,194 0
J. Willmott & Sons	3,628 0	Mattock Brothers	3,157 0
W. H. Lascelles & Co.	3,560 0	S. Goodall & Son*	3,150 1

MANSTON.—For erecting an isolation cottage, for the Isle of Thanet Guardians. Mr. R. A. Harris, architect, 3, Cecil-square, Margate:—

E. Padget & Son	£735 0 0	Horne & Co.	£580 0 0
G. H. Pettman	717 0 0	Anderson Bros.	575 0 0
J. Brown & Son	700 0 0	G. Miriams	500 0 0
W. H. Bouchier	665 0 0	A. E. Goodbourne	490 0 0
Huckell & Grimbly	637 3 0	G. Gray	475 0 0
C. G. Townsend	635 0 0	E. Yeates	445 16 8
Woodhall & Son, Ltd.	588 10 0	H. Noble, St. Peters*	395 0 0
A. Dyke	587 8 0		

NORMANTON.—For road-making and drainage, Normanton and District Joint Isolation Hospital. Mr. W. Hamilton Fearnley, architect, Station-lane, Featherstone. Quantities by Messrs. G. Connell & Son, Newcastle-upon-Tyne:—

R. Leake & Sons	£1,630 0 0	Barker & Co.	£967 3 0
M. Hall	1,281 4 9	G. M. Kerry & Co.	950 0 0
J. Rodger & Son	1,207 10 7	G. Clements	943 5 7
J. Brook	1,132 1 3	E. Rothera, Featherstone*	938 8 3
A. Yeates	1,077 7 8		
W. Morley & Sons	1,012 18 10		

[Architect's estimate, £997.]

NORWICH.—For erecting an octagonal brick chimney at the City Asylum, Hellesdon, for the Corporation. Mr. Arthur E. Collins, City Engineer, Guildhall, Norwich:—

J. W. Gray & Co.	£479 0 0	Alphons Custodis Chimney Construction Co.	£416 0 0
Downing Bros.	449 15 0	M. Warrington	400 0 0
Alexander, Nevins, & Co.	444 0 0	Youngs & Son	369 19 9
Neil & Co.	431 11 9	J. S. Smith	366 0 0
A. D. Boddy & Son	420 0 0	A. S. Lincoln	363 0 0
		W. J. Hannant, Churchill-rd., Norwich‡	358 0 0

‡ Recommended for acceptance.

NOTTINGHAM.—For erection of a pair of villas, Hendon Rise, Nottingham. Messrs. A. R. Calvert & William R. Gleave, architects, 18, Low-pavement, Nottingham:—

W. & J. Simons, Nottingham* £839

[Lowest of eight tenders.]

PORT TALBOT.—For erecting shop and premises, stables, and outbuildings, for Mr. Rees Evans. Mr. Frank B. Smith, architect, Port Talbot :—

J. Davies	£1,140	W. Jenkins	£1,065
M. Cox, Port Talbot*	1,125		

ROCHESTER.—For alteration to Delee Grange and erection of coals and wood lodge and two water-closets, for the Wardens of the Rochester Bridge. Mr. E. J. Hammond, surveyor, Balmoral-road, Gillingham :—

G. Baker, High-street, Strood* £151 10 0

ROCHESTER.—For repairs and repainting to exterior of Delee Grange, Upper Washenden Farm, and Bridge Chamber, Rochester, for the Wardens of the Rochester Bridge. Mr. E. J. Hammond, surveyor, Balmoral-road, Gillingham :—

H. Hollis, Strood and Brompton* £117 10 0

SCUNTHORPE.—For cast-iron pipes, etc., for the Urban District Council. Mr. A. M. Cobban, engineer, Scunthorpe. Quantities by engineer :—

Watson, Gow, & Co.	£5,216 9 4	A. G. Cloake	£4,343 11 6
Holwell Iron Co.	4,428 6 7	Cochrane & Co	4,305 19 11
H. Hall	4,389 15 4	Sheepbridge Iron Co...	4,254 0 5
Stanton Iron Co.	4,375 9 0		

SITTINGBOURNE.—For laying-out building estate, Sheerness, for Messrs. Vallance, of Sittingbourne, Kent. Mr. E. J. Hammond, surveyor, 21, Balmoral-road, Gillingham :—

G. Anger, Chatham and Herne Bay* £520

STAFFORD.—For erecting new elementary schools, etc., St. Leonard's-avenue, for the Education Committee. Mr. H. T. Sandy, architect, 22, Greengate, Stafford :—

G. I. Muirhead	£10,694 0 0	T. Godwin ..	£8,537 0 0
A. White & Sons	9,531 0 0	T. Tildesley..	8,446 0 0
J. Dallow & Sons	9,400 0 0	Jervis Bros..	8,444 0 0
Adams & Pemberton.	9,175 0 0	F. Espley & Sons	8,439 0 0
C. J. Nevitt..	8,900 0 0	C. Wright ..	8,427 0 0
F. L. Jones ..	8,734 0 0	C. Cave & Son	8,394 0 0
Young & Son	8,700 0 0	G. H. Marshall	8,290 0 0
T. Lowe & Sons	8,677 0 0	T. Mason, Hednesford*	8,170 0 0
Pegg & Bailey	8,647 0 0	E. Whittingham	8,145 0 0
H. Gough....	8,580 0 0	W. Skelhorne	7,995 0 0
G. Hodges ..	8,560 0 0	H. Dorse	7,849 17 0

STRATFORD. — For new premises, for Messrs. Williams & Thomas. Messrs. George Baines & R. Palmer Baines, architects, 5, Clement's-inn, Strand, London, W.C. :—

Estimate A.

Shurmur & Sons, Ltd.	£7,983	W. Wallis	£5,999
T. H. Kingerlee & Sons	7,177	G. J. Hosking	5,977
F. Gough & Co. ..	6,494	F. & H. F. Higgs..	5,947
Coulson & Lofts ..	6,307	Battley, Sons, & Holness	5,797
H. L. Holloway ..	6,190	C. North, Grove Works, Manbey-road, Stratford, E.‡	5,620
J. Grover & Son ..	6,182		
Kerridge & Shaw..	6,177		
Patman & Fotheringham	6,177		

‡ Accepted with modifications.

SUTTON (Surrey).—For alterations and additions to a part of the late South Metropolitan District Schools as a first section of the Belmont Asylum for Imbeciles, for the Metropolitan Asylums Board. Messrs. Thomas Dinwiddy & Sons, architects, Parliament-street and Greenwich. Quantities by Messrs. R. L. Curtis & Sons, Finsbury :—

Enness Bros., Erith* £15,730

TIPTON.—For construction of manholes and cast-iron pipe sewers under the Birmingham Canal at Toll End, for the Urban District Council. Mr. W. H. Jukes, Surveyor, Public Offices, Owen-street, Tipton :—

H. Hughes & Son.....	£490 0 0!	T. Allsopp	£227 0 0
C. Smith	320 0 0	H. Holloway, Wolverhampton*	155 0 0!
E. Boore	245 10 9		

[Surveyor's estimate, £245 6s.]

WARRINGTON.—For alterations to Stockton Heath swing-bridge over Manchester Ship Canal, for the Corporation. Messrs. Preece & Cardew, engineers, 8, Queen Anne's-gate, Westminster, S.W. :—

Sir W. G. Armstrong, Whitworth, & Co., Ltd...	£220
G. Thompson & Co.	172

WHALEY BRIDGE.—For steelwork for bridge over the river Goyt in Bridge-street, for the Yeardsley-cum-Whaley Urban District Council. Mr. C. R. Brady, engineer, 13, Warren-street, Stockport :—

Trafford Park Steel Co., Liverpool* £282 4 0

WHALEY BRIDGE.—For demolishing old bridge and erecting new over the river Goyt in Bridge-street, for the Yeardsley-cum-Whaley Urban District Council. Mr. C. R. Brady, engineer, 13, Warren-street, Stockport :—

Scathergood & Sons, New Mills* .. £275 10 0

WINCHESTER.—For alterations to shop front and premises, 1, High-street, for Messrs. Hillier & Sons. Messrs. Colson, Farrow, & Nisbett, architects, 45, Jewry-street, Winchester. Quantities by architects : —

G. White.....	£215 0 0	Coston & Co..	£189 0 0
H. Dominy....	206 14 8	H. Avery	189 0 0
J. J. Wise	198 0 0	Carter & Son, Winchester*	159 0 0
F. Bascomb ..	198 0 0		
Bagshaw & Son.	189 0 0		

WROUGHTON, WILTS.—For alterations and additions to the Three Tuns Inn, for Messrs T. & J. Arkell. Messrs. W. Drew & Sons, architects, Regent-circus, Swindon :—

E. Cowley, Wroughton*..... £282 5 0

[Four Tenders received].

WORKMEN'S HALL, NEW TREDEGAR.—In the list of Tenders for this work in our last issue the name occurs of "Cassmore & Perkins." It should have been Passmore & Perkins, Ynysddu. The mistake was not ours.

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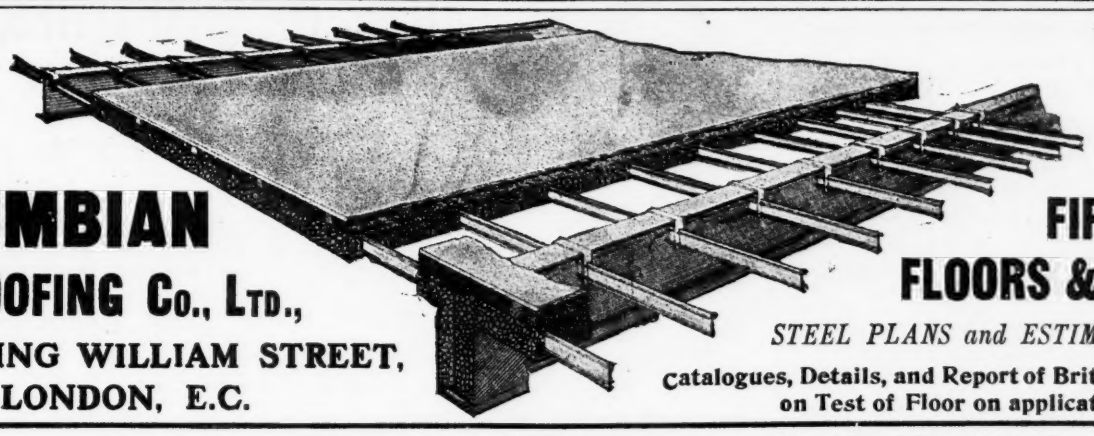

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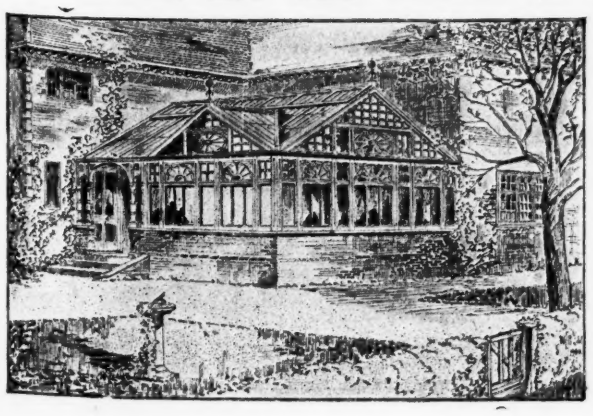

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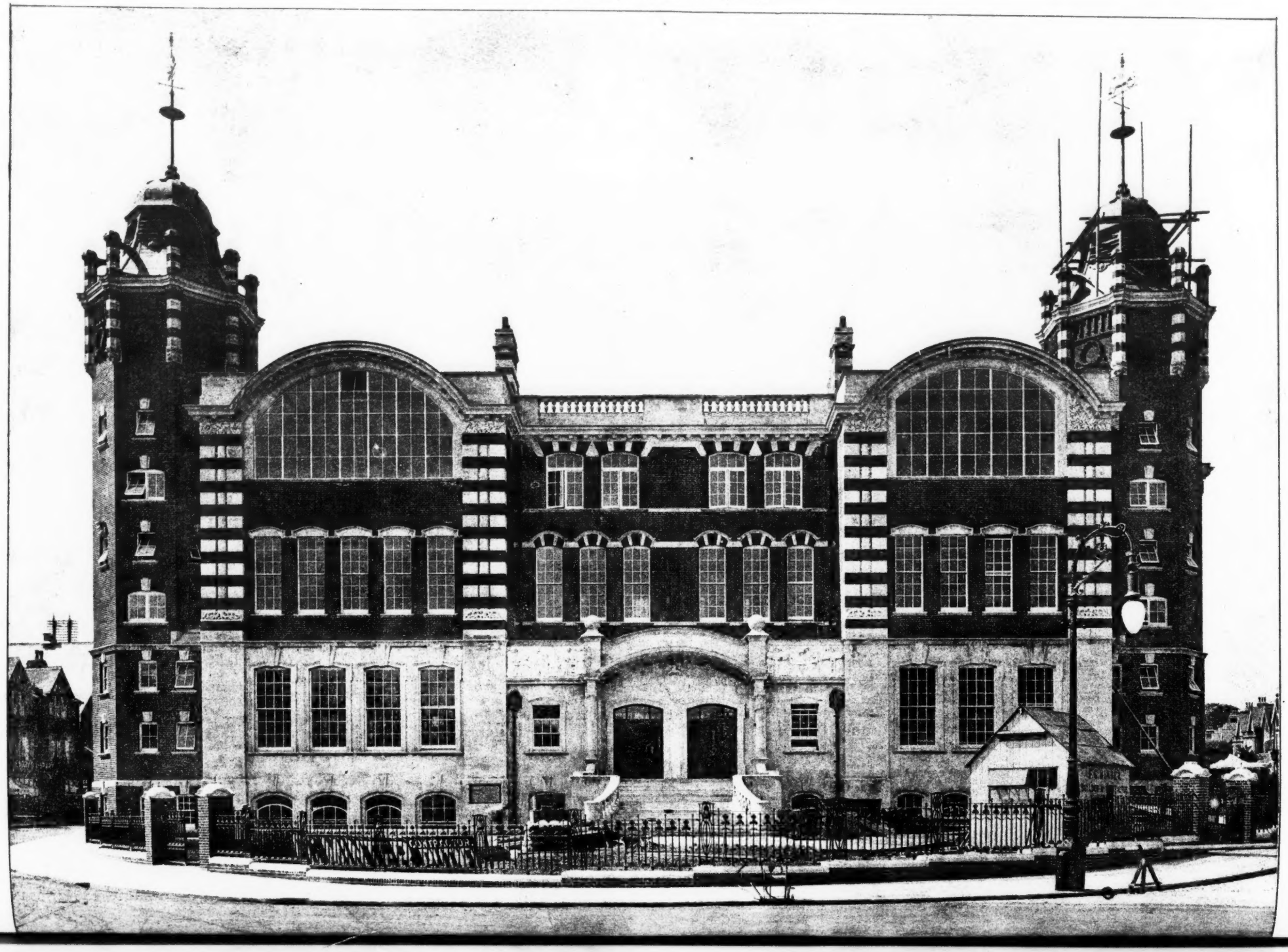

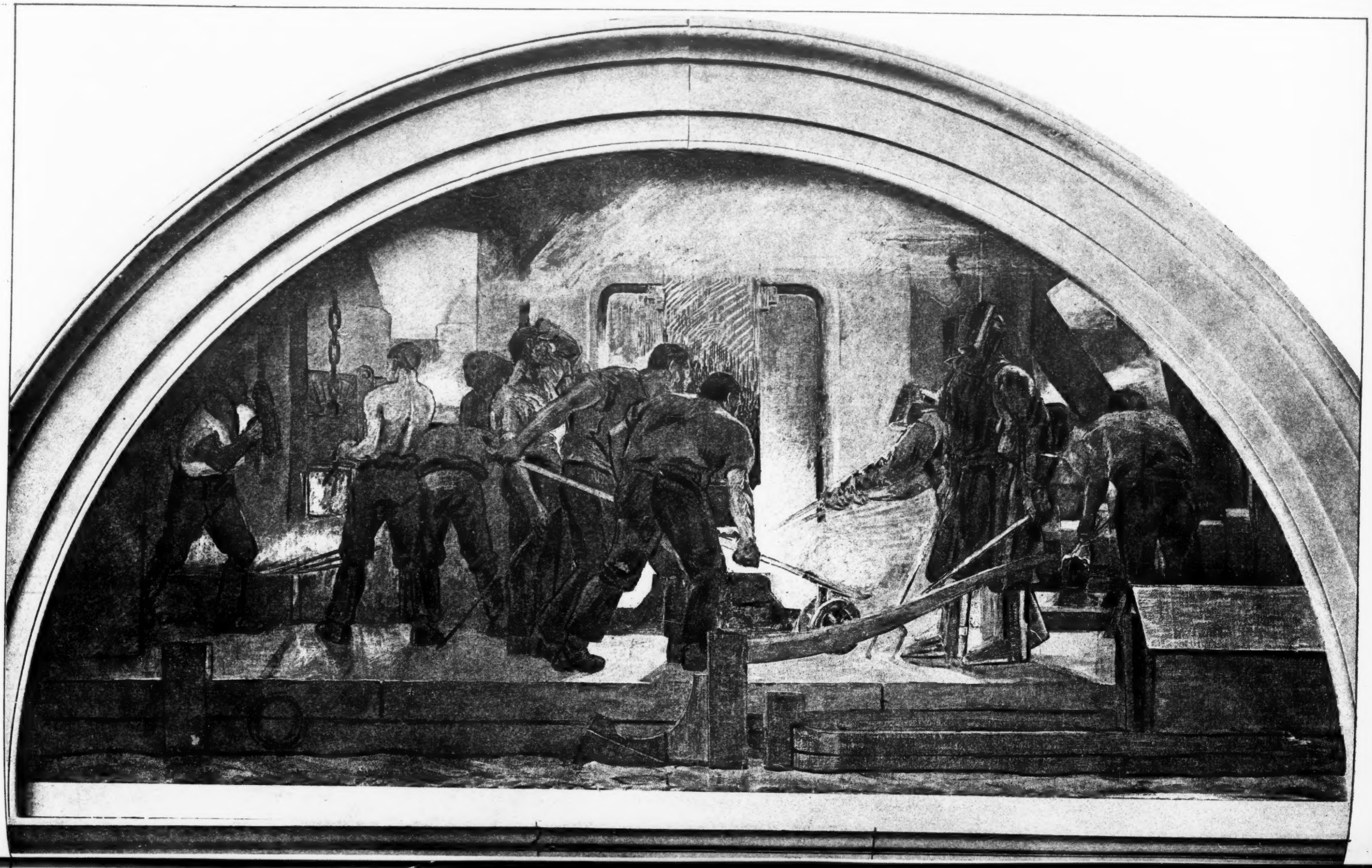

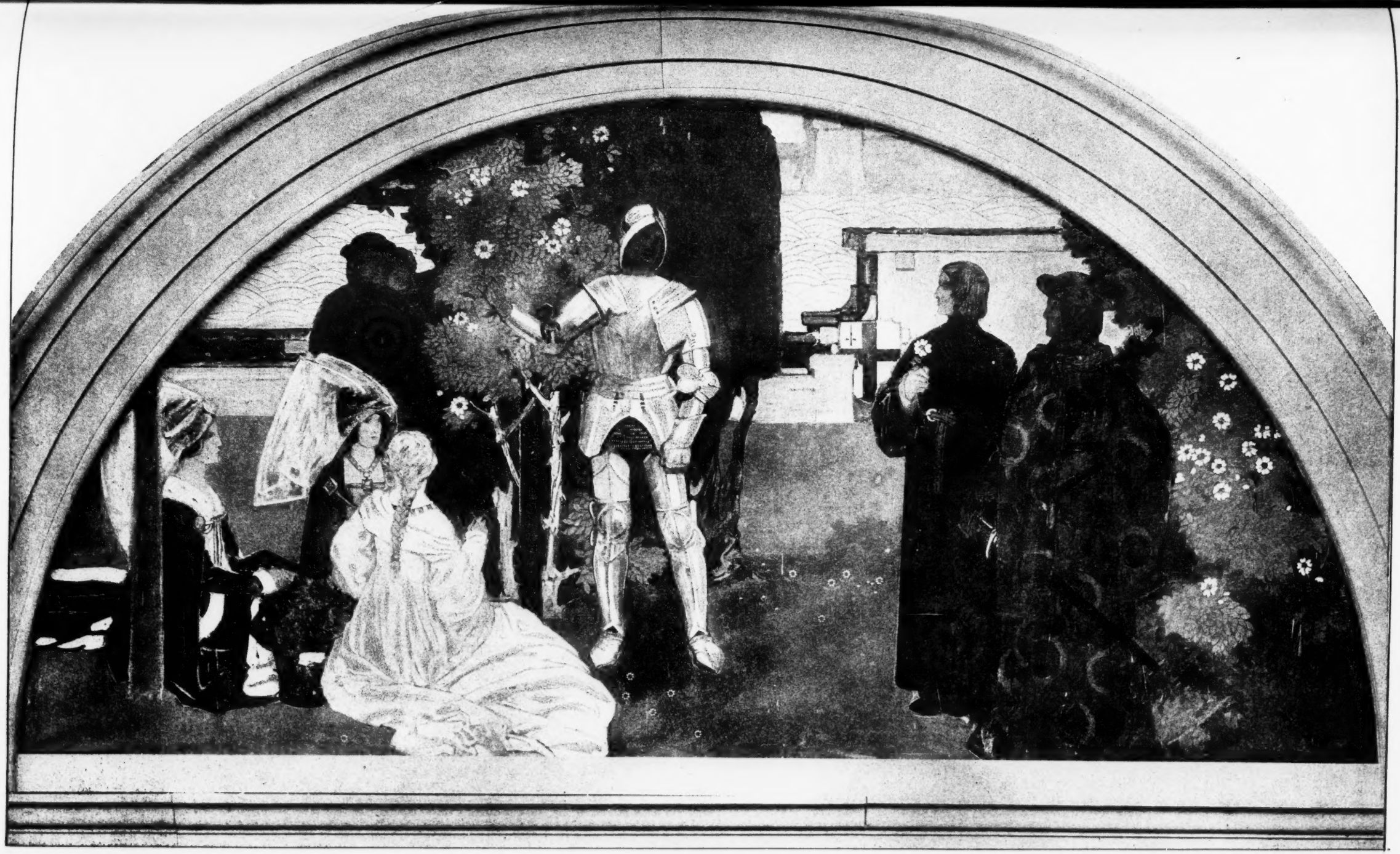

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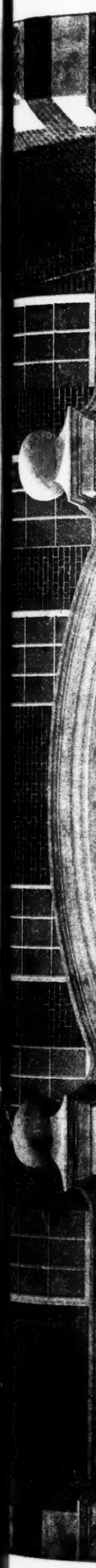

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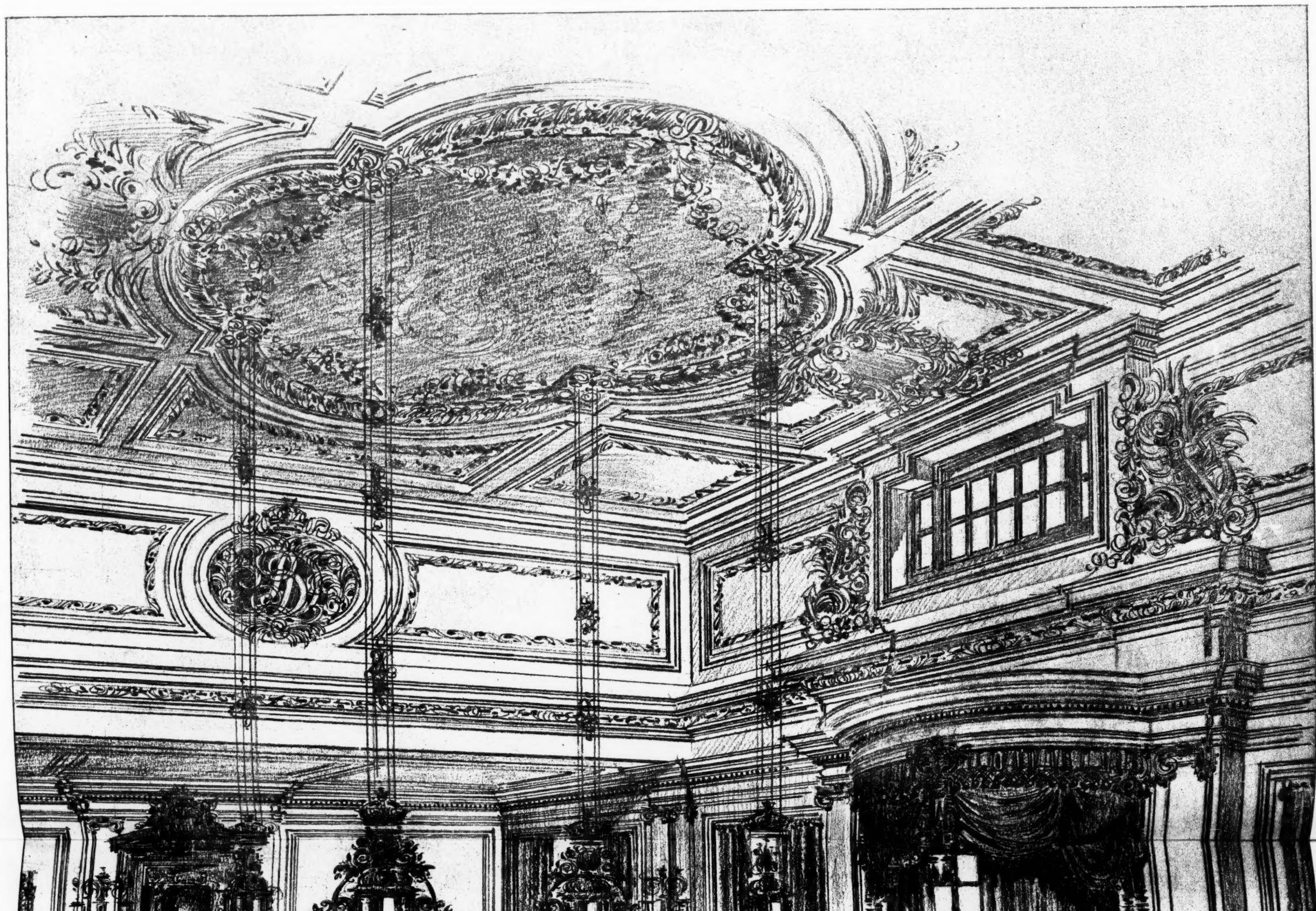

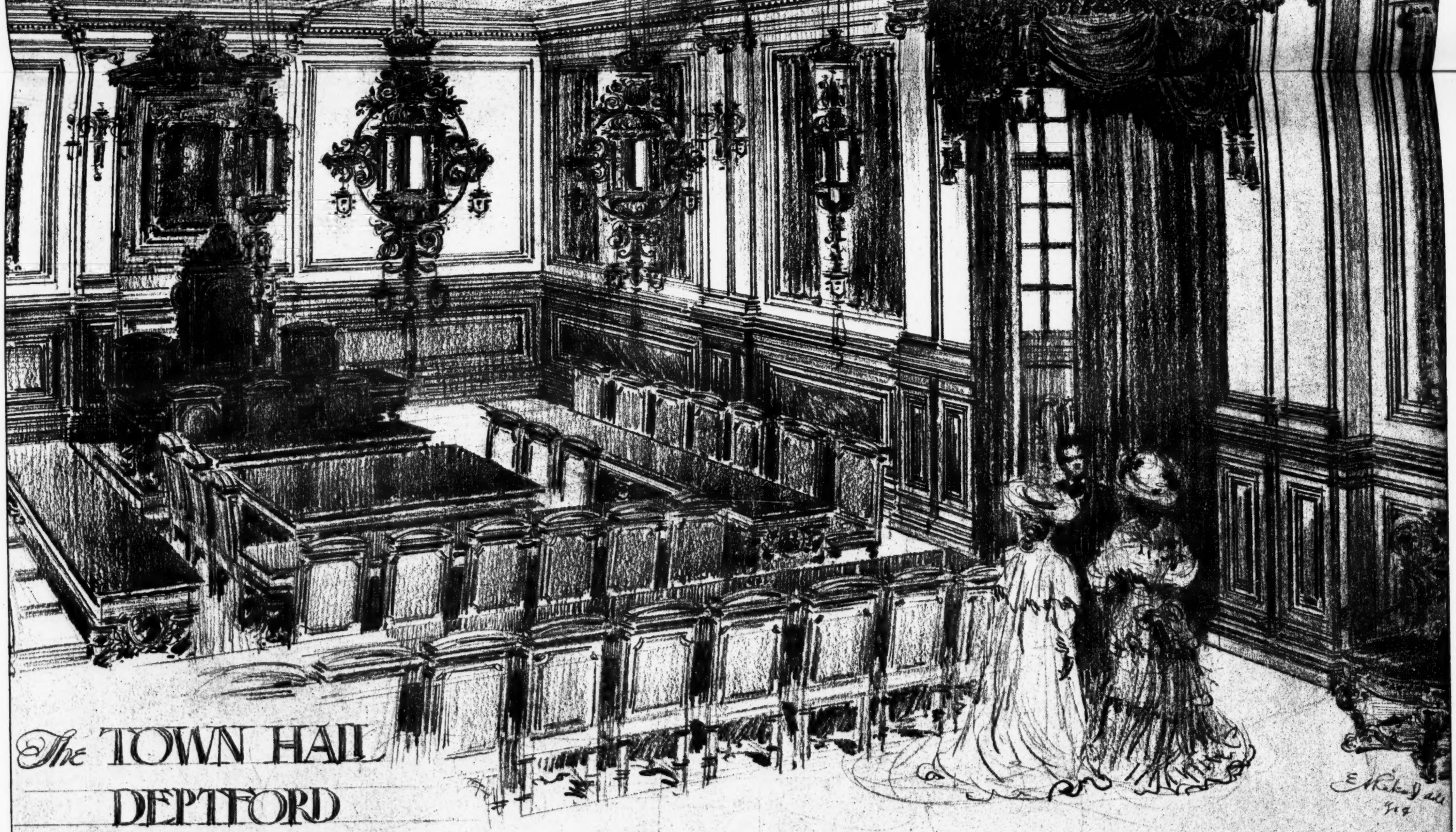

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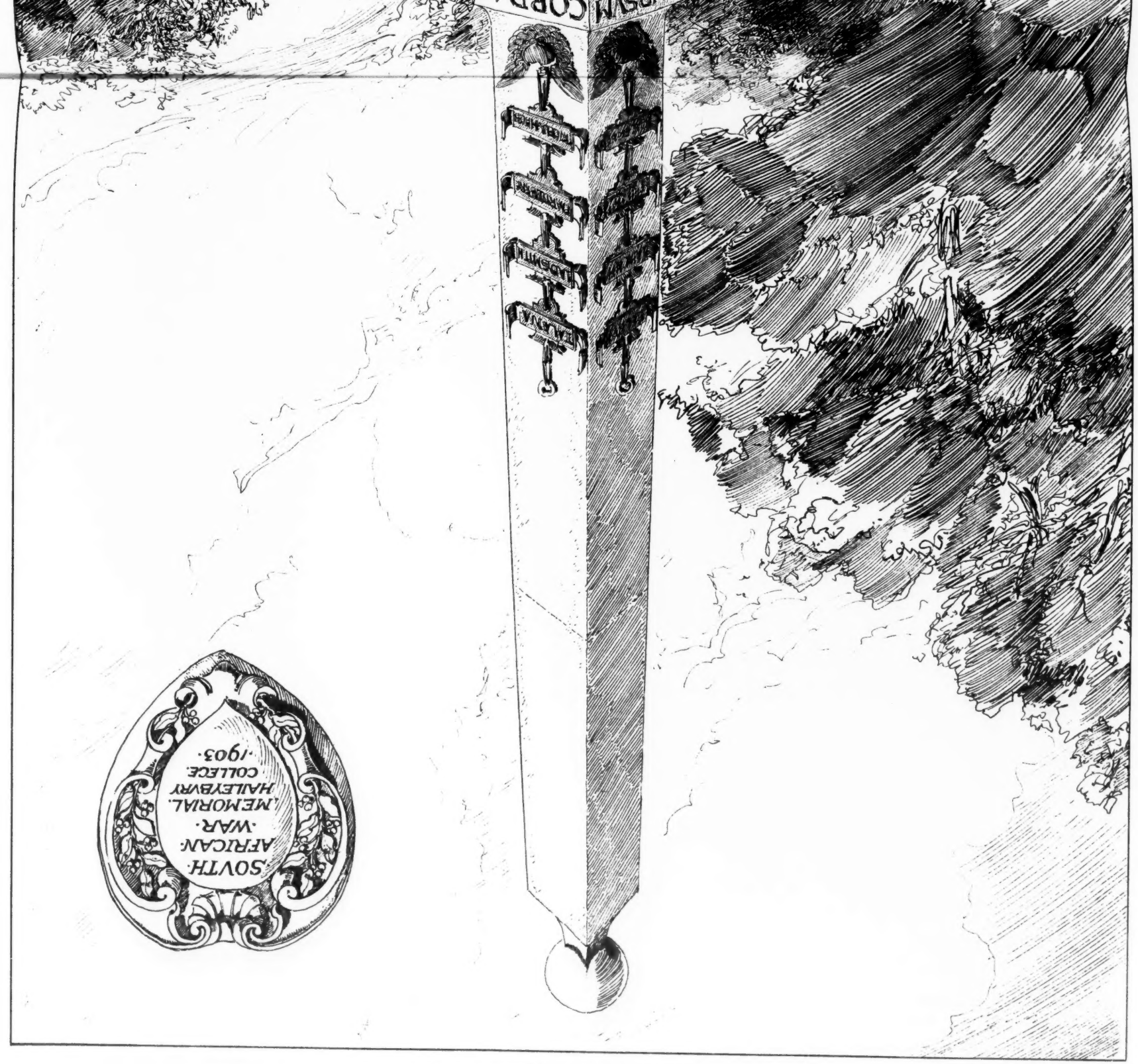
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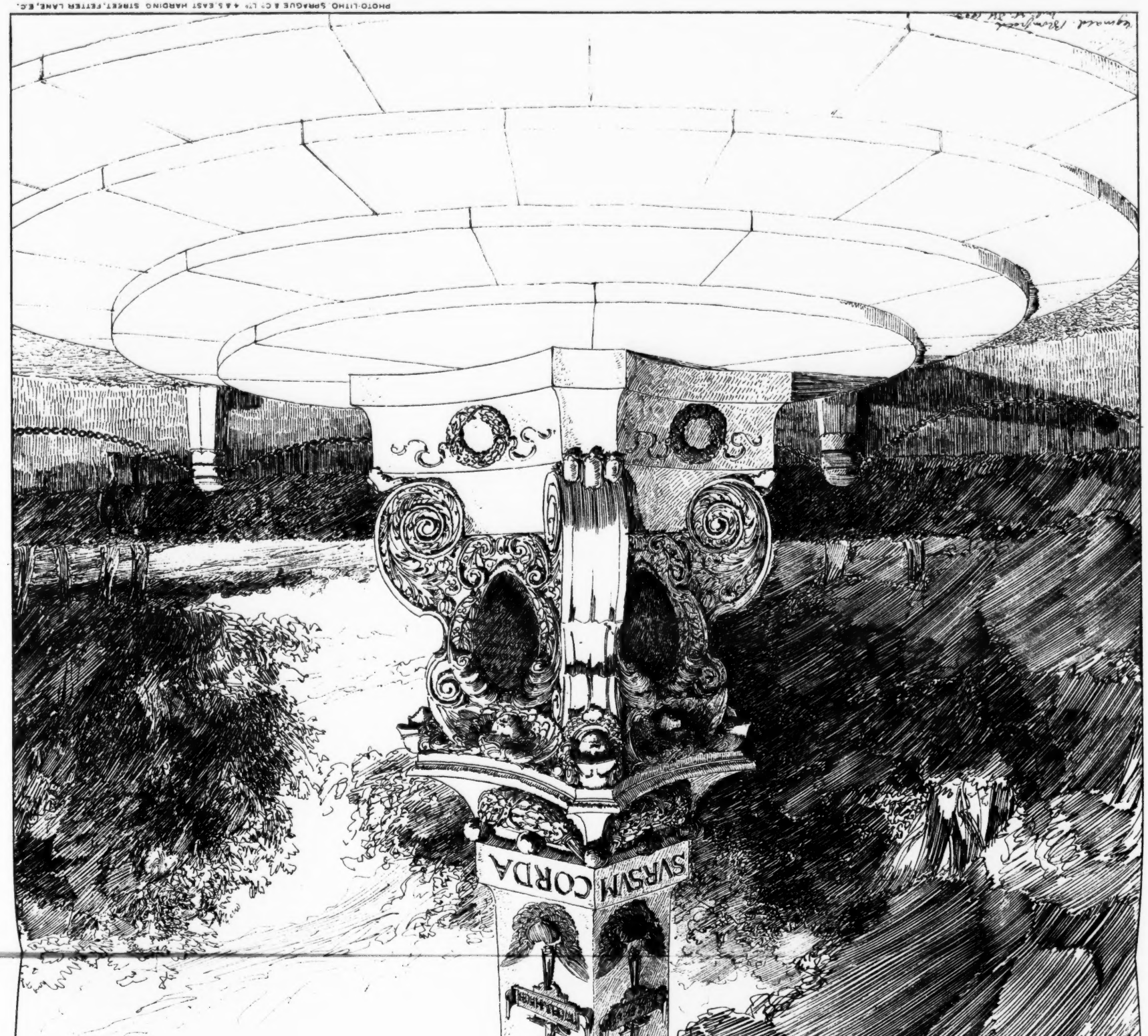
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